Office of the Trustees of
Washington's Headquarters
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Newburgh, N.Y.

July 8, 1955

Mr. Eric P. Newman
400 Washington Avenue
St. Louis 2, Missouri

Dear Mr. Newman,

Thank you for your letter of June 29th, about the bill for the chain-logs or boom. Your interpretation of the sets of links, bolts and clips is most helpful, and is confirmed exactly by the logs and links here.

Our janitor tells me he does not have any scale adequate to weigh one of the links, but believes he can manage to borrow one. As soon as that loan is negotiated, we'll weigh it, and send you both weight and measurements.

I tried to use x's, y's and z's, to calculate the weights of the different items on the bill, and there seemed to be enough data to make enough equations to resolve the problem, but I've forgotten the procedure!

Yours most sincerely,

Dorothy C Barck

Dorothy C. Barck
Historic Site Supt.

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July 12, 1955

Mr. Eric P. Newman, Secy.
Edison Brothers Stores Inc.
400 Washington Av.
St. Louis, Missouri

Dear Eric:

I found a copy of the 62nd Annual Report of the Connecticut Society of Civil Engineers at the Engineering Library and have had a photostat made of it which I am sending to you under separate cover. I am in the process of reading it; it looks like a pretty comprehensive article on the river obstructions.

I thought you would be interested in the obstructions on the Delaware and other rivers.

Sincerely yours,

Ed White

Edward E. White

EEW/bw

DISCUSSION

MR. WISE: You mention in your paper use of unit hydrographs for flood control work. A great deal has been written about the use of them. I would like to ask if, in the design of flood control reservoirs in New England, the unit hydrograph method is used, and to what extent they influence the design of flood control reservoirs.

COLONEL KERN: The unit hydrograph method is used exclusively for the design of spillway capacity. It is based on a hydrograph that is determined from runoffs of observed and recorded floods of the stream. Does that answer your question?

MR. WISE: Are they used to any great extent in the studies leading up to the design of the flood control reservoirs in New England?

COLONEL KERN: The capacity of the flood control reservoirs is based on observed or experienced runoffs, and the unit hydrograph studies for the establishment of spillway design criteria.

MR. ROBERT ROSE: I would like to ask the Colonel what part the denudation of forests have had in the effect of the storms and the floods in the Connecticut River Valley.

COLONEL KERN: The question of the effect of vegetation, I think, varies a great deal on the type of the soil. I do not think that reforestation in the Connecticut River basin will effect the Flood runoff. This is not a denuded area.

CHAIRMAN HENDERSON: Any further questions?

MR. ROSS: I would like to ask the Colonel if he is as modest in the statement of the likelihood of floods as was the speaker who we had here from one of the Federal agencies from Washington, and even though he was from Washington, a great deal of weight was put upon what he said. (Laughter) The question was asked in a lecture which he gave following the 1936 flood: When are we likely to have a flood equal to this one again? And he said, "From the best that I can figure, I would say about a thousand years."

The fact is that following the 1936 flood in Hartford, the Flood Commission was appointed and they got going, but, as I say, this statement was made and used as an argument against it to some extent. I think if we had not had the 1938 flood when we did, we might not have the fine protection against floods that we have here today, because having had that one within two years of the other, the Doubting Thomases were squelched and the protection was provided. I think the 1938 flood was a blessing in disguise as far as Hartford goes.

THE RIVER OBSTRUCTIONS OF THE REVOLUTIONARY WAR *

By Charles Rufus Harte, Honorary Member of the Connecticut Society of Civil Engineers. Engineer, The Connecticut Company, New Haven, Conn.

THE fact that their rivers furnished the only dependable transportation of the time, led the American Colonists, when it appeared that actual hostilities with Great Britain were inevitable, to give serious consideration to plans for preventing their navigation by enemy craft.

The Delaware River, furnishing under peace-time conditions easy access to Philadelphia, was a major danger line, but an even more serious threat lay in the fact that New England, the eastern end of Lower Canada, and the narrow strip of New York lying east of Lake Champlain and the Hudson River formed an area which at that time—today it is entirely encircled—was all but completely surrounded by navigable waters. It was feared, and with good reason, that sooner or later the British would attempt a pincer movement, an expedition coming up the St. Lawrence and Sorel rivers and through Lake Champlain forming one arm, to be met by a similar expedition up the Hudson. In a letter to General Israel Putnam, under date of December 2, 1777, after the British had destroyed the Fort Montgomery obstruction, General Washington wrote:

> "The importance of the Hudson River in the present contest, and the necessity of defending it, are Subjects which have been so frequently and fully discussed, and are so well understood, that it is unnecessary to enlarge upon them. These Facts at once appear, when it is considered that it runs through a whole State; that it is the only Passage by which the Enemy from New York, or any Part of our Coast, can ever hope to cooperate with an Army from Canada; that the possession of it is indispensibly essential to preserve the Communication between the Eastern, Middle and Southern States; and further, that upon its Security, in a great Measure, depend our chief Supplies of Flour for the subsistence of such Forces, as we may have occasion for, in the course of the War, either in the Eastern or Northern Departments, or in the Country lying high up on the West side of it." [1]

The probability that the British were fully aware of these facts had been appreciated considerably before the actual outbreak of hostilities, and various means for keeping them from taking advantage of the opportunities had been extensively discussed. Eventually, several types of obstruc-

* Presented at the 62nd Annual Meeting of the Connecticut Society of Civil Engineers, Inc., at Hartford, Conn., March 20, 1946.

[1] Sparks, Correspondence of the American Revolution, Vol. V, Page 177.

tion were employed, either alone or in combination, but the best of them could hardly be called very successful, while one group, that of the great chains, was practically worthless as a defence, although they may have had slight psychological value by their appearance of strength.

The River Chevaux-De-Frise

The most efficient of the river obstructions was the chevaux-de-frise, a modification of a device of the same name used in the Dutch War of Independence to stop charges of cavalry. Of this device Robert Beatson, the British historian, says:

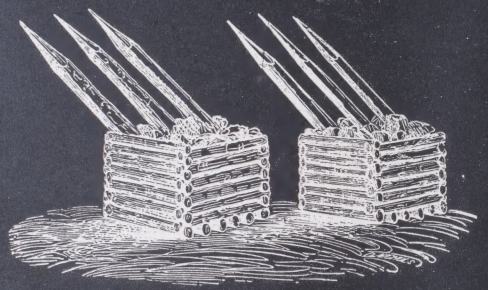


Fig. 1
Chevaux-de-frise Units, with the "Picks" Bedded in Stone-filled "Cassoons".

> "The rebel Congress . . . knowing how much their principal harbours and rivers were exposed to insult, from the superiority of the British Navy, they adopted an expedient for the defence of such places, by sinking ranges of frames or machines across their mouths, which made it extremely dangerous for the invader to force an entrance into them. These machines were supposed to be the invention of Dr. Franklin, to whom they did great credit. They were formed of large heavy square pieces of timber. Two long ones, at a proper parallel distance from each other, formed the horizontal base which was to rest on the bed of the river. Right over these were placed two others of similar size, rising from towards the end of the horizontal base, in such an angular direction, that any vessel sailing against them must be pierced by their elevated ends, which were, for that purpose, fortified with strong iron points, but did not appear above the surface of the water. The degree of elevation was such as to give the greatest resistance, with the least danger to the timbers. The four main pieces were joined to each other by many transverse ones; and the whole was so contrived, that its own weight and the weight added to it when sunk, should prevent it from being broken, forced backwards, or turned over. These machines were called by the Americans chevaux-de-frise; and with them the rivers Delaware, Hudson's or North River, near New York, and the approach to the town of Providence in Rhode Island, were fortified. To render access to them the more difficult and dangerous, the Congress caused a number of gallies to be built, and armed them with heavy cannon. These, placed behind the frames, gave great annoyance to the war ships when they approached them. The Americans reaped much benefit from the invention of the chevaux-de-frise." [2]

It is questionable, however, if credit for this device belongs to Franklin. On July 24, 1775, with Franklin, its President, presiding, and making no claims of authorship, the Pennsylvania Committee of Safety spread on its records:

> "Mr. Robert Smith, carpenter, appeared at this Board with a model of a Machine for obstructing the navigation of the River Delaware, and explained the construction of it, which was approved of. At the same time he made an offer of his services in attending and overlooking the workmen in building the same, gratis, for which this Board thanked him, and accepted the offer of his services." [3]

In the light of the date of the above quotation it is interesting to note what Heusser has to say about Robert Erskine:

> "Much has been written concerning the schemes for defending the Hudson River during the Revolution, but not one word of credit has ever been given to Erskine. Yet it was he who first suggested the contrivance of spiked beams and coffer dams which was employed on several occasions—unsuccessfully, it is true, between Forts Washington and Lee, but with better results farther up the river during the later years of the war." [4]

He then dates Erskine's "suggestion" by quoting from a letter Erskine wrote General John Morin Scott on July 18, 1776, a year after Robert Smith's "machine" had been approved of, and eleven months after the Pennsylvania Committee of Safety, on August 5, 1775, had recorded:

> "Mr. Owen Biddle presented to this Board, from Mr. Robert Smith, a model of a Machine for lowering and raising Ballast into and out of the Chevaux-de-Frise, to be sunk in this river; for which Mr. Biddle is desired to return to Mr. Smith the thanks of this Board." [5]

Erskine tells General Scott:

> "When I heard that some ships of war, with a fair wind and tide of flood, had passed the batteries with little or no damage; I could not help regretting that the Channel was left open. I know it has been proposed to stop it up, but the present exigency requires some contrivance, that shall be both speedily exe-

[2] Beatson, Naval and Military Memoirs: Volume IV, Pages 125-126.
[3] Force, American Archives: Series IV, Volume 2, Page 1775.
[4] Heusser, The Forgotten General: Page 116.
[5] Force, American Archives: Series IV, Volume 3, Page 497.

cuted and effectual. After canvassing this matter a little time, an invention which I beg leave to call a Marine Chevaux-de-Frise occurred. Of this I have sent you a model by the bearer, Platt Smith." [6]

He then describes how to put the model together, but gives little detail other than that the "Tetrahedron", as he calls it:

"has four horned corners x x and three horns to each corner; it is about 26 feet in depth x x and any vessel being swept upon horns within 14 feet of the surface, x x would either be staked upon it, or her velocity over-set it, the other horns would then rise and take her in the bottom." [7]

It would appear, however, that Mr. Erskine's invention occurred about one year late. No description has been found of Smith's "Machine", but the date of his proposal and the fact that he was very active in the work of placing the obstructions, which thereafter are often called "chevaux-de-frise" give excellent grounds for believing the credit for the invention belongs to him rather than to Franklin, least of all to Erskine.

The Delaware River Obstruction

The first plan for blocking the river passage to Philadelphia was to employ a boom, but on July 6, 1775, the Pennsylvania Committee of Safety, which had been created just one week before, on finding from a committee sent to investigate that between the "bar" and "Fort" or "Mud" Island was a distance of 150 fathoms (900 feet) or thereabouts, and that "at present" it was impracticable to lay a boom across that part of the river, appointed a committee of two for the construction of "Boats and Machines" for the defense of the river. Following the acceptance of Robert Smith's plan, work on the chevaux-de-frise was carried on steadily. An estimate of the cost of defending the Province, as reported September 29, 1775, included an item of 17 "chevaux-de-frise or defensive machines, to be sunk in the River Delaware, to prevent enemy ships coming against the City of Philadelphia", at a cost of £100 each, but eventually there were considerably more than 17. Beatson, after describing the defenses of Fort Island and Red Bank, just below the City, says:

"In front of these defences, to the extent of half a mile or more below the island, the channel is contracted to about the breadth of a hundred fathoms (600 feet, CRH). In this narrow part, several rows of the chevaux-de-frise were sunk, so as to render the passage of ships impracticable: and no attempt could be made to remove the upper range of these frames, or otherwise to clear the channel, until possession was obtained of both sides of the river." [8]

[6] Heusser, The Forgotten General: Page 117.
[7] *Ibid*: Page 118.
[8] Beatson, Naval and Military Memoirs: Volume IV, Page 267.

There is nothing to prove that the sum of a number of recorded payments to Robert Smith, Robert Morris and others on account of the chevaux-de-frise represents the total cost, but it does show that at least £7,706, 18 shillings and 11 pence was spent on them, considerably more than the £1,700 of the early estimate.

A secret channel allowed the passage of a friendly vessel when piloted by one of the ten men who supposedly were the only ones with the necessary knowledge, and who had been sworn to secrecy, the oath including the promise that:

"each of us will use his utmost skill and endeavours to keep out of the way of and prevent his being taken by any British man-of-war, armed vessel, or other vessel in the immediate service of the King of Great Britain." [9]

Five of the pilots were to be stationed at Philadelphia, and five at Chester, and when one had guided a vessel through the obstruction he was to return at once to his station, using his own boat. For their services the men first asked 7 pounds, 10 shillings per month, but they accepted 6 pounds when sworn in on October 21, 1775. However, a couple of months later, on December 18, their pay was raised to 7 pounds per month, and then, on October 8, 1776:

"This Board, taking into their consideration the advance prices of almost every necessity of life x x do hereby

"Resolve, That the said Pilots, in additon to their pay from the State, be allowed, from the date hereof, to receive 5s per foot for every vessel they conduct through the chevaux-de-frise, to and from Chester, to be paid by the captains or owners of such vessels." [10]

Presumably this "foot" was of width, the important element. A very few vessels per month apparently would mean a very substantial increase in pay.

Evidently there was considerable concern over the existence of the secret channel, and how to block it in case of necessity, as appears from the records of the Safety Committee. November 8, 1775, Mr. Owen Biddle, Captain Whyte and Mr. Clymer were appointed a committee "to consider the most effectual way of connecting the chevaux-de-frize" and to procure a chain for that purpose; March 26 of the next year Arthur Donaldson was to be employed "to build two piers to sink for fixing the boom for obstructing navigation"; four days later Howell Nixon and Captain Whyte were instructed to get two vessels most proper for sinking in the passage between the chevaux-de-frise; April 6 Captain Rice and A. Donaldson were

[9] Force, American Archives: Series IV, Volume 3, Page 1824.
[10] *Ibid*: Series V, Volume 2, Page 82.

instructed to construct two chevaux-de-frise for the same purpose; and July 15 one Penrose and Donaldson were to fix the two piers in the line of the upper chevaux-de-frise and fasten the boom to them.

September 14, 1776, Lord Howe started his fleet from the mouth of the Elk River, at the head of Chesapeake Bay, to come down that bay and up Delaware Bay and the Delaware to support General Howe in his attack on Philadelphia. On the same date Captain Blewer and Mr. Gurney were authorized to contract with some person or persons to fill up and complete the piers sunk in the channel of the river, and "fix the chain for stopping navigation upon an emergency."

By October 11 the British fleet had come up to Chester and had cut a passage through the first range of chevaux-de-frise. There remained, however, two more ranges of "frames", and on that date, October 11, the Committee:

> "Resolved, That Messrs. Rittenhouse, Joseph Blewer, Emanuel Eyres, and Peter Brown, go down to the Piers tomorrow, and fix upon a method for fastening the chain, and give directions to Thomas Davis and Lewis Gyon to prepare everything necessary to fasten it without delay; and that the Commodore order the boom to be brought up to Kensington, to Mr. Peter Brown's landing, as soon as the tide will serve." [11]

However confused the construction of the Delaware River obstruction may appear to have been, thanks to the excellent co-ordination with fleet and forts it was far and away the most effective of any employed by the Colonists. The two British Howes overcame it, but only by the combined efforts of army and fleet, and the operation, which began on October 1, was not completed until November 20, 1776, when:

> "The forts and shipping, which had hitherto protected the obstacles to the navigation of the river, being now dismantled or destroyed, such openings were made in the different ranges of sunken frames, as admitted the small ships of war to anchor off the town, and the transports and storeships to lie alongside the quays of Philadelphia; this was of the greatest service to the army, which still kept the field." [12]

The Hudson River Chevaux-de-Frise

May 25, 1775, the Continental Congress sent to the New York Provincial Congress a series of Resolutions, the second of these being as follows:

> "That a Post be also taken in the Highlands on each side of Hudson's River, and Batteries erected in such manner as will most effectually prevent any vessel passing, that may be sent to harass the inhabitants on the border of said river;

[11] Force, American Archives: Series V, Volume 2, Page 84.
[12] Beatson, Naval and Military Memoirs: Volume IV, Page 273.

> and that experienced persons be immediately sent to examine said river, in order to discover where it will be most advisable and proper to obstruct the navigation." [13]

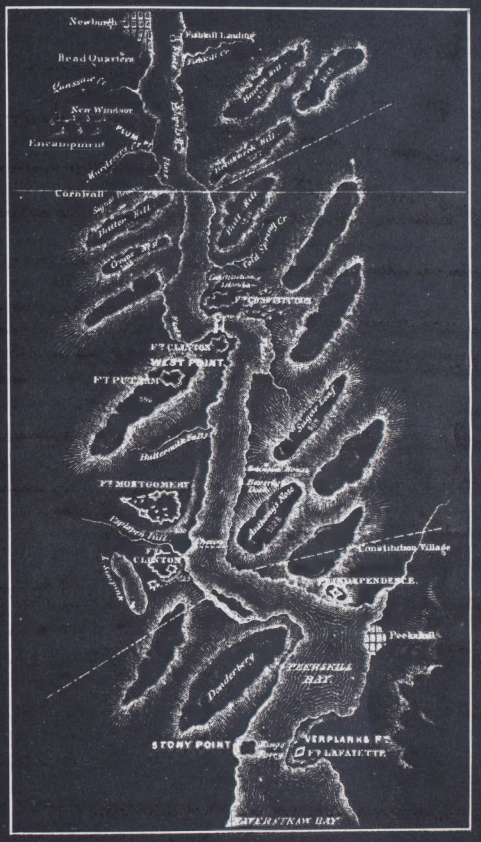


Fig. 2
Map of the Hudson River Between Newburgh and Stony Point, showing locations of both Fort Montgomery and West Point chains, and, a little below Newburgh, Pollopel's Island, site of chevaux-de-frise.

In accordance with this Resolution, Colonel James Clinton and Mr. Tappan were appointed a Committee of two, and followed their recommenda-

[13] Force, American Archives: Series IV, Volume 2, Page 844.

tion work was at once begun on what were to become forts Montgomery and Clinton, but nothing was done in the way of obstructing the river for some time. Ruttenber says:

> "In the Journal of the Provincial Convention, we find that these Obstructions received the Attention of that Body in the early Part of the Year 1776. It was then determined to obstruct the Navigation of the River at this Point (beween forts Washington and Lee, CRH) by Chevaux-de-Frize, and the work of their Construction was immediately commenced, and some of them sent down and sunk." [14]

On July 26, 1776, General Putnam, who was in command of the Middle Department, of which this location was a part, wrote to General Gates:

> "We are preparing Chevaux-de-Frize, at which we make great Despatch by the Help of Ships, which are to be sunk; a Scheme of Mine, which you may be assured is very Simple, a Plan of which I send you. The two Ships' Sterns lie towards each other, about seventy Feet apart. Three large Logs, which reach from Ship to Ship, are fastened to them. The two Ships and Logs stop the River two hundred and eighty Feet. The Ships are to be sunk, and, when hauled down on one side, the Picks will be raised to a proper Height, and they must inevitably stop the River, if the Enemy will let us sink them." [15]

Early in September, apparently because of faulty loading one or two of the "frames" as the chevaux-de-frise were frequently called, were reported as "floating with the tide", and Captain Cooke, who seems to have been in direct charge of the work, advised the "Convention"—as the Congress had been called since July 10—that he was apprehensive the chevaux-de-frise might not be sufficient for stopping the enemy ships, but that, in his opinion, if five or six vessels were sunk to the northward they would "tend much to render the obstruction effectual."

The Secret Committee, appointed July 16, 1776, to devise and carry out plans for obstructing the channel of Hudson's River, which up to this time had had nothing to do with the Fort Washington obstruction, was called upon and sent down two old sloops "intended to be sunk"; two brigs, not commented on; and two fine new ships, valued at £2,800 and £3,429, respectively, the sinking of which, unless absolutely necessary, "would become a matter of concern."

On October 3, Tench Tilghman, who seems to have had general oversight, wrote, apparently to the Convention:

> "Capt. Cook is now up the River cutting Timber for the Chevaux-de-Frize; as he is much wanted here to sink the old Vessels, the Gen. begs that you would immediately send him down; we are at a Stand for want of him, for as he has Superintended the Matter from the beginning, he best knows the properest places to be Obstructed." [16]

[14] Ruttenber, Hudson's River Obstructions: Page 38.
[15] Sparks, Revolutionary Correspondence: Volume IV, Page 30.

If Captain Cook was sent down at once it is evident that he did not succeed in obstructing "the properest places", for on October 9, Tench Tilghman reported to the Convention:

> "About 8 o'Clock this Morning the Roebuck and Phoenix, and a Frigate of about 20 Guns, got under way from about Bloomingdale, where they have been laying for some Time, and Steered on with an easy Southerly Breeze towards our Chevaux-de-Frize, which we hoped would have given them some Interruption, while our Batteries played upon them; but to our Surprise and Mortification, they all ran through without the least Difficulty, and without receiving the least apparent Damage." [17]

The capture of Fort Washington by the British a week later made it impossible to restore these obstructions, even if it had been thought desirable so to do.

Following the failure of the Fort Montgomery chain in November of 1776, and before the decision to repair and replace it had been reached, it was decided to follow General James Clinton's suggestion that the river be obstructed by chevaux-de-frise at Pollopel's Island, some ten miles upstream from Fort Montgomery. The work was pushed with great energy, and on March 12, 1777, to a committee appointed by the Convention, General Clinton reported:

> "The Obstruction of the Navigation is in great forwardness; a number of Frames and Blocks are ready for sinking x x x those Works will be completed by the Middle of April." [18]

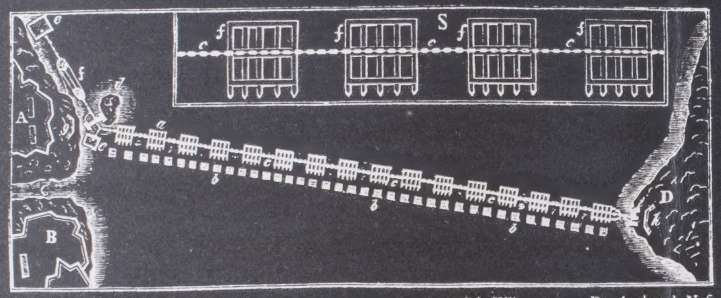
The fact, however, that on April 26, 1777, the Convention appropriated two thousand pounds "for the use of the Works carrying on to Obstruct the Navigation in Hudson's River near Pollopel's Island" would seem to indicate that General Clinton had been a little too optimistic in his report. By October 8, however, the obstruction was far enough along to be a serious menace, for Beatson, describing the expedition by General Sir Henry Clinton and Commodore Hotham which captured forts Montgomery and Clinton and burned Kingston, says of that day, October 8:

> "The Commodore immediately (after the capture of Fort Constitution, CRH) sent orders to Sir James Wallace to proceed higher up the river, and if possible to find a passage through the chevaux-de-frize, between Polypus island and the main." [19]

[16] Ruttenber, Hudson's River Obstructions: Page 50.
[17] *Ibid*: Page 51.
[18] *Ibid*, Page 112.
[19] Beatson, Naval and Military Memoirs: Volume IV, Page 237.

That such a passage was either found or made is evident, for on October 14 Major General Vaughan was escorted higher up the river to Kingston by Wallace. It was presumably to close the gap Wallace found that led Governor Clinton, under date of January 17, 1778, to write:

> "I would advise, that the Chevaux-de-Frize be completed under the Directions of Capt. Machin, who has hitherto had the Management of that Business. He knows how many are yet wanted and where to be sunk, so as to perfect the Obstruction." [20]



A Fort Montgomery. B Fort Clinton. C Poplopin's Kill. D Anthony's Nose.
a Floats to Chain. *b b b* Booms in front of Chain. *c c c* Chain.
d Rock at which the Chain was secured with large Iron Roller. *e e* Cribs and Anchors.
f Blocks and Purchase for tightening Chain. *g h* Ground Batteries for defence of Chain.
S Section showing Floats and Chain. *c c c* Chain. *f f f* Floats.

FIG. 3
PLAN OF INTENDED OBSTRUCTION AT FORT MONTGOMERY.
Actually the boom iron arrived too late to be used, and there was no boom.

While the Hudson River chevaux-de-frise were by no means as effective as those of the Delaware, the frequent references to them by Beatson show that the British had a healthy respect for them.

THE FIRE SHIPS AND FIRE RAFTS

Unlike the chevaux-de-frise and the chains, which were defensive obstructions, the fire ships and fire rafts were offensive devices, based on a very old procedure. Considerably over a thousand years before Christ, the Philistines were greatly annoyed by Samson, who tied firebrands to foxes' tails and sent the blazing beasts through his enemy's grain fields.

Fire ships and fire rafts, prepared under the direction of Captain John Hazlewood, of Philadelphia, for use in connection with the Delaware River obstruction, are mentioned by both American and British authorities, but the only record found of the actual use of the rafts is by Beatson. He says:

[20] Ruttenber, Hudson's River Obstructions: Page 114.

> "When Lord Howe arrived off Chester, he learned that the squadron of frigates, under Captain Hamond, were at anchor off Billing's Point; where the fortifications erected by the enemy had been effectually destroyed, by Lieutenant-Colonel Stirling and the detachment under his command. This had enabled the Captain to exert his small force, with unremitting assiduity, in endeavouring to cut a passage for ships, through the first range of frames or chevaux-de-frise. The enemy had repeatedly attempted, by fire rafts, gallies, and other craft, to prevent the success of his operations; but without doing any material injury to the frigates. By a great deal of severe and difficult labour, during the whole progress of which he was exposed to perpetual danger, he at length opened a channel in the river sufficient for the large ships." [21]

Incidentally, this account gives a good picture of the effectiveness of the Delaware chevaux-de-frise.

While fire ships and "fire vessels" are mentioned as being at Philadelphia, it is only as being at the wharves or at Fort Island, where they were captured with other vessls, or as trying to escape up the river after the town was taken.

On the Hudson the story was different. Early in July of 1776 the committee which had charge of the construction, at Poughkeepsie, of Continental frigates, was instructed by General Washington to complete a number of fire rafts and fire vessels for use at Fort Constitution, and on July 16 Jacobus Van Zandt, apparently in charge, wrote Governor Clinton of New York:

> "As you were pleased to forward us Genl. Washington's Orders to complete a Number of Fire Rafts and Fire Vessels, we have the Pleasure to inform you that four Fire Rafts will be launched this Evening. Tomorrow, we propose to fix them in the best Manner we can with dry Wood, Tar and such other Combustibles as we can procure at this Place. Two or three old Vessels we shall fix as fast as possible for the same Purpose. We shall send the Fire Rafts down to Col. Clinton as soon as completed." [22]

With the appointment of the Secret Committee the business of preparing the fire ships and fire vessels was placed in its hands, and on July 27 it made a list of what was required:

> "Light Wood and Pine Knots for Fire Vessels, to be got at Esopus and Albany.
>
> "Mr. Tappan to procure three old Sloops and send them down to Poughkeepsie loaded with those Knots and Light Wood, and as much Pitch, Tar, Turpentine, and Tar-Tubs and Barrels, as can be got.
>
> "Mr. Livingston and Mr. Yates to procure the same Number of Sloops and to send them down loaded with the same Materials. The Pitch, Tar and Turpentine not to exceed 100 Barrels. Also, Oakum and Junks of Rope. Also, to Procure 100 Ash Oars from 14 to 20 feet long.

[21] Beatson, Naval and Military Memoirs: Volume IV, Page 200.
[22] Ruttenber, Hudson's River Obstructions, Page 20.

"Mr. G. Livingston to procure six Long Boats and send them to Poughkeepsie. To get about twelve Fire Grappling Irons made. To get 1,000 Fire Arrows made. To fit up one or two armed Sloops at Albany. To send to Salisbury for all the Cannon and all the Shot that can be procured there." [23]

The Hudson River fire ships seem to have been employed but once, on the night of August 16, 1776. In 1826 the Worcester, Massachusetts, "Worcester Magazine" published a sketch of the life of Joseph Bass, of Leicester, Massachusetts, who, under command of Commodore Tupper, had charge of one of the fire ships. Ruttenber, who apparently abstracts the account, as he uses no quotation marks, says:

"The Commodore selected Bass to take Charge of one (of the two fire ships used, CRH), and put the other under the Command of Captain Thomas, who belonged to New London. The Vessel commanded by Bass was a Sloop, called the Polly, of about one hundred Tons burthen, nearly new. That commanded by Thomas, was of a smaller Size. The Frigates lay about eight Miles above Kingsbridge, but having had Intimations that they might be attacked, removed their Station towards the western Shore of the River, where the Water was deeper than on the east side.

"The Fire Ships had been prepared with Faggots of the most combustible Kinds of Wood, which had been dipped in melted Pitch, and with Bundles of Straw cut about a Foot long, prepared in the same Manner. These Faggots and Bundles filled the Deck and Hold as far aft as the Cabin; and into this Mass of combustible Materials was inserted a Match, that might be fired by a Person in the Cabin; who would have Time to escape through a Door cut in the Side of the Vessel, into a Whale Boat that was lashed to the Quarter of the Sloop. Besides these Combustibles, there were in each Vessel ten or twelve Barrels of Pitch. A Quantity of Canvas, amounting to many Yards, was cut into Strips, about a Foot in Width, then dipped in Spirits of Turpentine and hung upon the Spars and Rigging; extending down to the Deck. Everything had been so prepared that but a Moment's Time was required to set the whole Vessel in a Blaze.

"The Fire Ships started from the Spuyten Duyvel Creek about Dark, with a south Wind and a favourable Tide. The Night was Cloudy and Dark, with occasionally a little Rain. Bass had nine Men attached to his Vessel, three of whom he stationed in the Whale Boat, four had Charge of the Grappling Irons, and one acted as Pilot, while Bass stationed himself in the Cabin to fire the Materials.

"Besides the two British Frigates, there was a Bomb Ketch and two Tenders; which were moored near them. They were anchored in a Line about North and South; first the Phoenix of about 44 Guns; next the Rose of 36 Guns; then the Bomb Ketch, and above it the Tenders. As the Night was Dark and the Fire Ships kept near the Middle of the River, they were not aware that they were near the British Vessels, until they heard, immediately on their Left, the striking of the Bells, and the Cry of the Sentinel's 'all's well'. It was

[23] Ruttenber, Hudson's River Obstructions: Page 21.

twelve o'Clock, and little did those who were slumbering there imagine the Destruction that hung over them. The Shore was bold and rose above the Masts, and, in its dark Shadow, the Americans could not distinguish the Situations of the Vessels, neither could they ascertain their Size; or which of them were Frigates. Bass was a considerable Distance in Advance of Thomas, and upon hearing the Cry of the Sentinels, he immediately bore down upon the Line of the British Fleet. He was already very near the Bomb Ketch before he was discovered by the Enemy, and soon struck her. The Grappling Irons were made fast in an Instant—the Whale Boat was ready to cast off—the Match was applied, and both Vessels were almost immediately in a Blaze. Bass and his Crew made their way to the Shore, while the Panic-struck Crew of the Ketch were seen pouring from their Quarters in the utmost Consternation. Several of them perished in the Flames, others jumped into the Water, and were rescued by the other Vessels of the Fleet; and the Ketch soon burned so as to part from her Moorings, when she drifted on Shore, and was consumed to the Water's Edge.

"Capt. Thomas was not so fortunate. He was far in the Rear, and the Light from Bass's Ship showed his Position to the Enemy; who opened a vigourous Cannonade and prepared themselves to meet the Attack. But, nothing daunted by being discovered, he bore down on the Phoenix, and became grappled with her. He then applied the Match to the Combustibles, but in such a way that his retreat to the Boat was cut off, and he was obliged to leap overboard to escape the Flames. Five of his Men were compelled to follow his Example, and not being able to reach the Boat, all perished in the Water.

"Notwithstanding the Phoenix was on Fire in several Places, she was saved from Destruction by cutting away Portions of her Rigging, and slipping her Cables. In the Attack, the Enemy lost nearly seventy Men, besides some Women and Children, who were on board the Ketch." [24]

Although there is casual mention of fire ships in some later records, the only other instance of actual use seems to have been in connection with the ill-fated siege of Quebec. A number of ships, anchored at that place, close to the town, where they had spent the winter, offered an excellent opportunity, not only for burning them, but, if the attack was successful, through them setting fire to the town. With much difficulty a fire ship was fitted up, and on the night of May 3, 1776, it was sailed almost to the vessels without raising any suspicions. Unfortunately for the plan, just at this point the shore batteries, which had supposed the vessel was a British one, suddenly realized their mistake and opened fire. Either as a result of the excitement, or because of a lucky shot, there was a premature explosion; the ship burst into flames, forcing the crew to abandon her in midchannel, and with the ill-luck that characterized all the moves in the Canadian invasion, she drifted away from the target and burned up without doing any damage to the enemy.

[24] Ruttenber, Hudson's River Obstructions: Page 27.

Difficult to navigate sufficiently close to an intended victim before being discovered; a perfect target when discovered unless it had practically reached its goal; and very apt to prove a death-trap for its crew in any case; to be successful a fire ship had to have much better luck than was vouchsafed to the Colonists in their use of the device.

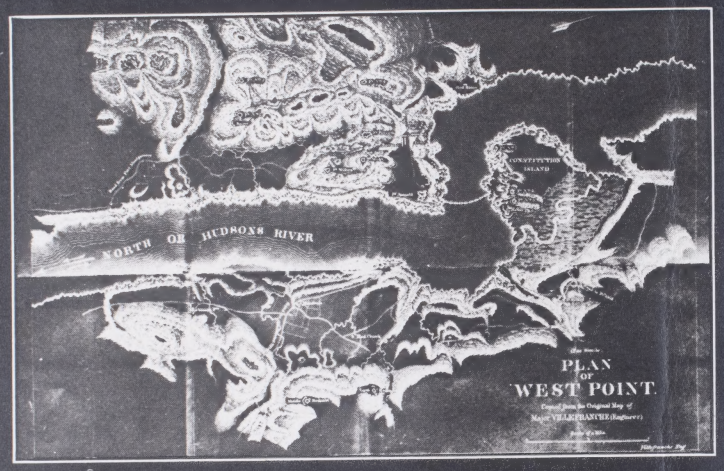


FIG. 4
WEST POINT, FORT CONSTITUTION, AND THE GREAT WEST POINT CHAIN.

THE GREAT CHAIN OBSTRUCTIONS

The great chain obstructions were intended to hold enemy vessels while shore batteries destroyed them; actually, while they were costly and spectacular, lack of proper shore support left them with very little defence value. However, securing and fabricating the material for the great chains at a time when such material was both scarce and in much demand for other uses, while facilities for doing the work were almost non-existent, and then transporting, assembling and placing the completed device under the existing conditions, were most remarkable and outstanding industrial and engineering achievements. At that, all except the one at West Point were easily overcome; at Fort Montgomery the British added insult to injury by carrying off the great chain as a trophy; and in view of what happened elsewhere, it is a fair assumption that the reason the West Point obstruction was not destroyed was because it never was even threatened.

The complete "chain obstruction" consisted of two separate parts. That which gave it its name was a massive chain, stretched across the channel, its ends securely anchored, while it was held at or close to the surface of the water by a series of floats, to each of which it was well fastened, while the pull of the current on the floats was taken by a series of up-stream anchors to which the floats were chained. It was because of this construction, which divided the span into sections, that some parts of it had to withstand heavier pull than did others.

A short distance in front of the great chain was the protective boom, consisting of a series of heavy logs held parallel to the stream and to each other by short sections of heavy chain shackled to them at or fairly close to their ends. At each end of the boom similar chains, but longer, were extended to anchorages, while, as in the case of the great chain, the pull of the current was transferred to a series of up-stream anchors. The sections of coupling chain usually were lighter than the great chain, but the fact that there were two lines of them, and that the logs were only about ten feet apart, made the boom actually considerably stronger than the more showy device it protected.

An unfortunate tendency on the part of the early writers to call anything stretched across and on the surface of the water a "boom" is responsible for much confusion regarding these obstructions. It is definitely known that in several instances a great chain construction is referred to as a boom, raising the question what really was meant when the term was used at certain other points, notably at Isle aux Noix, Fort Constitution, and the Delaware River below Philadelphia.

PRE-REVOLUTIONARY "CHAIN OBSTRUCTIONS"

THE TROIS RIVIERES OBSTRUCTION

The French, in the French and Indian War, in at least three instances, used such obstructions, the performances of which might well have served as a warning to the American Colonists some fifteen years later, although at that the Trois Rivieres obstruction seems to have caused the most delay of any in either war.

In his description of General Murray's expedition against Montreal, Captain John Knox, under date of August 12, 1760, recorded:

> "At five o'clock A. M. our fleet weighed; our soundings from three to four and an half, until we cleared St. Peter's lake, at the W.S.W. end of which the channel runs through a clutch of islands, where we got into deep water, from five to seven fathoms and an half, with bold shores; we were interrupted in our course by a boom thrown by the enemy a-cross the river, so that we were obliged to come to an anchor at nine o'clock, until this obstacle could be re-

moved. x x (here follows a description of the scenery, CRH) x x The boom consisted of a sixteen inch cable, run through a parcel of thick iron rings, covered with spars or clamps of wood, lashed round with cordage; at the two extremities, on two islands situated rather obliquely than otherwise, were large square redoubts, so shaded by trees that they were not perceptible until the ships advanced close upon them; our seamen were three hours employed in cutting away this boom, and were rewarded for their trouble by a great anchor, to which it was moored in the center of the channel." [25]

It should be noted that this obstruction was of the great chain type, although it employed, not a chain, but a great cable, five inches in diameter, but Knox calls it a "boom" as does Beatson, who, however, puts the date four days earlier than does Knox. He says:

"On the 8th of August, the fleet passed by Trois Rivieres, which the enemy had made as strong as time and circumstances would admit of; and having removed a strong boom, laid across the river by the enemy to obstruct the navigation, they, on the 12th, anchored off Sorrel." [26]

Apparently the redoubts were not manned; had they been, and armed, this obstruction undoubtedly would have caused a materially greater delay than the three hours Knox was held up.

The Carillon, or First Ticonderoga Orstruction

Major Robert Rogers, of the famous New England Rangers, gives us the only account found of the boom at Carillon, as Ticonderoga was first called by the French. His diary reports:

"July 24. This day the engineers were employed in raising batteries with the assistance of a large portion of the troops; the remainder, being engaged in making fascines until the 26th at night. Scouts from the Rangers, were during this interval, continually kept out in the vicinity of Crown Point, by whose means the General had hourly intelligence from that post.

"Orders were given to cut away a boom, which the French had thrown across the Lake, opposite the Fort, which prevented our boats from passing, and cutting off the French retreat. For this purpose, two whale boats and one English flat boat were conveyed across the land from Lake George to Lake Champlain, opposite their camp; from thence intending to steer along the east shore, and silently saw off the boom, which was composed of logs of timber fastened together with large iron chains.

"At nine o'clock we had nearly reached our destination, when the French, who had previously undermined the fortress, sprung their mines, which blew up with a tremendous explosion, and immediately commenced a retreat in their boats." [27]

[25] Captain John Knox, Journal: Volume II, Page 491.
[26] Beatson, Naval and Military Memoirs: Volume II, Page 385.
[27] Stark, Reminiscences of the French War: Page 84.

Beatson makes no specific mention of the boom, but it was perhaps because of it that, after the explosion and evacuation of Fort Carillon:

"Every exertion was now made to get the batteaux and whale boats into Lake Champlain, which was a most laborious piece of work." [28]

The Isle Aux Noix Obstruction

As in the case of the Carillon boom, there is but one reference to the Isle aux Noix obstruction, which quite possibly was the former, carried down the river by the French in their retreat from Carillon. Captain Joshua Pell, a British officer moving up the "River Sorrell" with Burgoyne in August of 1776, wrote in his diary concerning Isle aux Noix:

"This Isle was well fortified by the French last war, and had a Boom across the River in order to stop our entrance into Canada, after the reduction of Ticonderoga and Crown Point." [29]

As Beatson, describing Captain Haviland's expedition down the Sorel to join General Amherst at Montreal lays his delay at Isle aux Noix from August 24, 1760, until the 27th, to "The fort the enemy had there" [30] without mentioning any river obstruction, the boom could not have been a very serious obstacle.

The Revolutionary Chains
The Sorel Chain

On May 3, 1776, General Washington, then at New York, advising General Philip Schuyler, at Albany, concerning various matters, wrote:

"You will also receive the Chain which General Lee order'd and which I think should be sent to and fix'd at the Place it is designed for, with all possible Expedition. It may be of great Service and Benefit." [31]

This "hush, hush; you know what I mean", attitude was characteristic; in the case of this first chain there was much concern lest the British learn of the intended scheme, and the records are very scanty and often obscure. However, two days later than his letter to Schuyler, Washington, on May 5, wrote John Hancock, President of the Continental Congress:

"I have sent with the last Brigade (to go to Canada at that time, CRH), x x also the Chain for a Boom at the Narrows of Richelieu x x and have wrote General Schuyler to have the Boom fixed, as soon as possible." [32]

[28] Beatson, Naval and Military Memoirs: Volume II, Page 274.
[29] Pell, Diary: Bull. Ft. Ticonderoga Museum, Volume 1, No. 6, Page 5.
[30] Beatson, Naval and Military Memoirs: Volume II, Page 396.
[31] Fitzpatrick, Washington's Writings: Volume V, Page 9.
[32] *Ibid*: Volume V, Page 15.

May 10 Schuyler wrote to Washington:

> "The chain is to go on today, which I shall forward to General Arnold, with directions to fix it. I suppose it was intended for the Rapids of Richelieu." [33]

That it was so forwarded would appear from Justin Smith's statement in his description of the desperate situation of the Americans at Sorel, the site of the rapids, about May 27, 1776:

> "The high water had prevented Arnold from sinking a chevaux-de-frise, as he called it, at a narrow place in the St. Lawrence five miles below; and evidently, as the flood still continued, the chain brought from New York proved useless." [34]

However, the chain was considered of much importance, for it was one of the heavier items brought back to Ticonderoga in the terrible retreat that followed, by what Jeduthan Baldwin, doubtless somewhat prejudiced by the theft of some of his personal property, called "This Retreating, Raged, Starved, lousey, thevish, Pockey Army".[35]

The writer has been unable to find any specific information as to when or from whom Lee ordered the Sorel chain; what was the size of the iron bar used for the links; or what was the length of the chain; but there is enough circumstantial evidence to justify certain guesses.

On February 17, 1776, Robert Morris wrote General Charles Lee that "this day it was moved in Congress that you shou'd be appointed to the command in Canada,[36] and two days later this was confirmed by President John Hancock.[37] But on the 28th the latter requested Lee not to set out for Canada until he received further orders from Congress,[38] and on March 1 Lee was advised that Congress had decided to change the earlier assignment, and had now decided that he should "take command of the Continental forces in the Southern Department, which comprehends Virginia, North Carolina, South Carolina and Georgia." [39] It seems very likely, therefore, that the order was placed some time between February 19 and March 1.

As to the maker, the contract with the Sterling Iron Works for the West Point chain has these specifications:

> "an Iron Chain x x each Link about two Feet long to be made of the Best Sterling Iron, two Inches and one Quarter Square, or as near thereto as possible, with a Swivel to every hundred Feet, and a Clevis every Thousand Wt., in the same manner as those of the Former Chain." [40]

[33] Force, American Archives: Series IV, Volume 6, Page 413.
[34] Justin Smith, Struggle for the Fourteenth Colony: Volume II, Page 427.
[35] Jeduthan Baldwin, Journal, Page 60.
[36] Lee Papers, Volume I, Page 304.
[37] *Ibid*: Page 310.
[38] *Ibid*: Page 333.
[39] *Ibid*: Page 342.
[40] Hornor, Obstructions of the Hudson River: Facsimile.

No other details are given, and, loosely drawn as were many contracts of that time, it seems hardly likely that the expression "in the same manner as those of the former chain" would have been used with reference to two of the most important elements of the chain if the contractor, if not the actual maker of "the former chain", had not been thoroughly familiar with its manufacture.

Peter Townsend's Sterling Iron Works and Robert Erskine's Ringwood were the two works capable of making the Sorel chain which were nearest New York, Lee's headquarters when the order was placed; the plants were close together; used the same Sterling ore; and assisted each other from time to time. Had either had the order the other doubtless would have known all the details, and since it was an urgent matter, probably would have assisted in the manufacture. It seems not unreasonable, therefore, to believe that either Sterling or Ringwood or both made "the former chain".

It is a question what was the size of the bar used, but it seems pretty certain that it was either one-and-one-half inch, or two inch. When the Secret Committee, fearing that the chain or piece of chain—or for that matter, no chain—that General Schuyler would send them might be too short by itself, and they called on Robert Livingston to make, until countermanded, bar iron obviously intended to supply any shortage—a marginal note in the Committee's Minutes reads: "For 600 yds, or 1800 feet of Chain, you want 4800 foot of Bar Iron in length" [41]—they specified 1½ inch bar. This was on July 25, but on August 11 Livingston, referring to 2 "tuns" of iron delivered, 3 more ready, and 5 to be ready "by Saturday" (6 days later), says: "All the Iron made since your last Orders is 2 inch," [42] raising the question whether the Committee was in error as to the size in the first place, or whether they decided to make the new portion stronger than the old. On September 2, 1776, Livingston rendered a bill for £902, and as his price was £45 per ton, that would represent a trifle over 20 tons, sufficient, allowing for some waste, for a little less than 2,000 feet of 1½ inch chain or a little more than 1,000 feet of 2 inch; but there is nothing to tell whether or no this bill covered all the iron Livingston furnished.[43]

As to length, Dr. Thacher says the Ticonderoga obstruction, which supposedly used at least a portion of the Sorel chain, was 1,200 feet in length,[44] while on August 13, 1776, Robert Yates advised Washington he had received a piece of chain from Ticonderoga which would form a quarter part of the one designed for Hudson's River, and that the latter would be

[41] Ruttenber, Hudson's River Obstructions: Page 69.
[42] *Ibid*: Page 92.
[43] *Ibid*: Page 92.
[44] Thacher, Military Journal: Page 81.

at least 2,100 feet long.[45] This gives a total of at least 1,750 feet for the Sorel chain, but, unfortunately, the assumption is pretty "iffy".

The Fort Montgomery Obstruction

The comment of Colonel Clinton and Mr. Tappan in connection with their June 13, 1775, report on the place for fortifications "on each side of Hudson's River" that:

> "Your Committee beg leave to observe, that they are informed that by means of four or five booms chained together on one side of the river, ready to be drawn across, the passage can be closed up, to prevent any vessel passing or repassing." [46]

apparently received no consideration until July 16 of the next year, 1776, when what had once been "The Provincial Congress of the Colony of New York" but on July 10 had changed its name to "The Convention of the Representatives of the State of New York" resolved, unanimously:

> "That a Secret Committee be appointed to devise and carry into Execution such Measures as to them shall appear most Effectual for Obstructing the Channel of Hudson's River, or annoying the Enemy's Ships in their Passage up said River; and that this Convention Pledge themselves for defraying the Charges incident thereto.
>
> "That Mr. Jay, Mr. Robert Yates, Major C. Tappan, Mr. Robert R. Livingston and Mr. Paulding be said Committee." [47]

According to Ruttenber's transcription of the Minutes of the Committee, at their first meeting, held at Fort Montgomery, it was decided to use rafts made of great logs, but the difficulty of obtaining the latter led to a change in plans, and on July 20 they wrote General Schuyler, asking that, since the chain intended to obstruct the Sorel River could not now be used for that purpose, he send it, or as much of it as could be spared, "to prevent the Enemy's Ships from going beyond the Hook on Hudson's River" [48] and the next day they advised the Convention that they had determined to throw a boom across the river, and asked to have 150 logs 14 fet long, of white pine or any other wood that would float, sent to them.[49]

On July 25, Jacobus Van Zandt, Augustus Lawrence and Samuel Tudor, "or any two of them", were appointed to superintend, under the direction of such of the Committee as might be at Poughkeepsie:

[45] Force, American Archives: Series V, Volume 1, Page 935.
[46] *Ibid*: Series IV, Volume 2, Page 986.
[47] Ruttenber: Hudson's River Obstructions; Page 13.
[48] *Ibid*: Page 68.
[49] *Ibid*: Page 67.

> "The making of a Chain to fix across Hudson's River at the most convenient place near Fort Montgomery, and fixing the same; and if it should be found Impracticable at or near the said Fort, then to fix the same at or near Fort Constitution." [50]

At the same meeting it was voted to send to Schuyler for the chain, and as it might not be long enough, Colonel Robert Livingston was called on "to make until countermanded by this Committee" a quantity of 1½ inches square bar iron, a marginal note in the Minutes pointing out that for

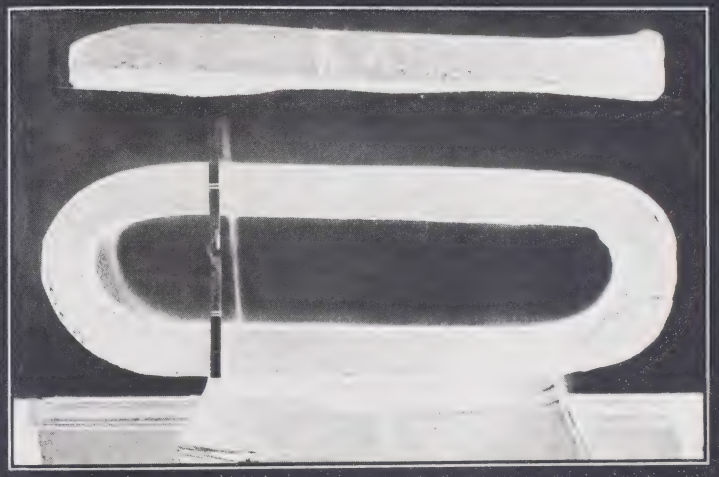


Fig. 5
One of the Smaller Links of the West Point Chain, Owned by the Connecticut Historical Society.
Notice the roughness, both of the bar of which it is made, and that of the workmanship, particularly the twist shown in the side view.

1,800 feet of chain there would be needed 4,800 feet of bar iron "in length." [51] Colonel Livingston's works were at Ancram, New York, some thirty miles northeast of Poughkeepsie and ten miles northwest of the famous Connecticut Ore Hill mine, from which he obtained the ore he used.

Also on the 25th Schuyler, in response to the Committee's request, wrote that he had forwarded the letter to Gates, who had succeeded him at Ticonderoga, and who doubtless would send them the chain if he could spare it, but:

[50] Ruttenber, Hudson's River Obstructions: Page 70.
[51] *Ibid*: Page 69.

"Before I left Tyconderoga, we had it in Contemplation to Draw it across that Part of Lake Champlain which Divides Tyconderoga from the Camp we occupy on the East Shore opposite to it. I would not wish you, therefore to make too great a dependence upon receiving it." [52]

This uncertainty, and possibly some message from Gates not located, led to another change in the plans. On August 1, 1776, the Committee:

"Resolved, That it appears to the Members of this Committee, that the Chain intended for the River Sorel, will in all probabilities, be retained at Ticonderoga; that the making one of sufficient Length will occasion great Delay; that the Rafts heretofore agreed upon by this Committee, at the Meeting held at Fort Montgomery, and laid aside on Account of the Difficulties of procuring the necessary Spars, will be the most effectual and speedy Means of obstructing the Navigation of the River; that it appears to this Committee, that the Wood necessary for forming the Rafts may be procured, a Contract having been made for the same by Mr. Tappen, with the Approbation of Robt. Yates, Esq., and Mr. R. Livingston. (the cost was £1,000, for 160 spars 50 feet long. CRH).

"Resolved, Therefore, that Mr. Jacobus Van Zandt, Mr. Lawrence and Mr. Tudor be directed to form the Rafts agreeable to the following Plan: That each Raft be formed of five Logs of not less than fifty feet in length, placed ten feet apart, and framed together by three cross Pieces; that each Raft be placed fifteen feet apart and Connected by strong Chains of 1½ inch thick, and anchored with their Butts down the River; that the Butts be shod with iron.

"That each Member of this Committee be directed to Enquire for and Purchase as many Anchors and Cables as they can procure and send Word to this Committee by the 7th Day of this Month of the Number they can obtain." [53]

By the 13th, however, conditions had again changed. A piece of the Sorel chain had come to Albany; Direk Schuyler was paid £15 for bringing it and some pine knots from that place to Poughkeepsie; and Robert Yates wrote General Washington:

"The chain intended for the Sorel is arrived, and will form a quarter part of the one designed for Hudson's River. The iron for the remainder is come to hand, and the smiths began this day to forge it. We have agreed to fix one end of it at Fort Montgomery and the other at the foot of a mountain called Anthony's Nose. It will cross the river obliquely, and for that reason be less exposed to the force of the tide, and less liable to injury from the ships of the enemy. The length of the chain will, at least, be twenty one hundred feet." [54]

Progress of the work apparently was slow; on September 27 the blacksmiths were ordered to "desist from any other Business until they have completed the said Chain" but with the saving clause "as soon as furnished with iron." [55]

[52] Ruttenber, Hudson's River Obstructions: Page 68.
[53] *Ibid*: Pages 72-74.
[54] Force, American Archives: Fifth Series, Volume I, Page 935.
[55] Ruttenber, Hudson's River Obstructions: Page 78.

October 9 the Committee voted that the one-and-one-half inch bar iron at Poughkeepsie be "worked up into Chain in order to strengthen the large Chain".[56] Unless the Committee considered the supporting rafts as part of the chain, this action is hard to understand. August 11, Robert Livingston, reporting on the iron situation, wrote: "all the Iron made since your

FIG. 6
COMPARISON OF WEST POINT CHAIN LINKS.
Upper—Smaller, 30 inches long, of 2¼ inch bar. Owned by the Connecticut Historical Society, Hartford, Connecticut.
Lower—Larger, 44 inches long, of 3½ inch chamfered edge bar. At the U. S. Coast Guard Academy, New London, Connecticut.
Note the difference, both in workmanship and in the bars from which the links are made.

[56] Ruttenber, Hudson's River Obstructions: Page 79.

last orders is 2 inch" [57] and as it was not until August 13 that the blacksmiths began work on the extension it seems probable that that was in the heavier section. If so, that would have left the 1½ inch bar furnished between July 25 and the date of the "last orders" on hand at Poughkeepsie. It could readily be used on the raft system or on the anchorage, but it is difficult to understand how it could have been used to "strengthen" an existing chain.

Until October 14, 1776, there was uncertainty as to whether it was better to place the obstruction at Fort Montgomery or at Fort Constitution. River conditions at the latter place were more favorable for the obstruction, but the June 1, 1776, report of Lord Stirling to Washington, bitterly criticizing Bernard Romans' fortification there, for, among other short-comings, its inability to fire at an enemy vessel until it was directly in front, while the fort itself was dominated by hills a hostile force could easily seize,[58] eventually proved the deciding factor, and in spite of Jacobus Van Zandt's vigorous protest, of which more later, the Secret Committee, meeting at Fort Constitution, decided that:

> "Considering that there are no Works erected at this Post that can defend the Chain proposed to be stretched across the River here, and the impracticability of executing any in Season for the above purpose, and believing that the River at Fort Montgomery in the narrowest place is but 1,600 feet wide, which exceeds the width of the River here but 100 feet, therefore,
>
> "Resolved, That Mr. Machin immediately prepare a place on each Side the River at Fort Montgomery to fasten the Ends of the intended Chain to; that he place two or three Guns in a small Breast-work to be erected for that purpose on the Flat place just under the North end of the Grand Battery, where the Fire-Rafts now lay; also a small work, if Time permit, near the Water Edge, on the South side of Poplopen's Kill." [59]

October 22 Gilbert Livingston was directed to send down to Fort Montgomery such parts of the chain as were fixed to its logs, and shortly before November 28 they were assembled and swung into position, for on the latter date the New York Convention reported to the Continental Congress:

> "In projecting the obstruction between Anthony's Nose on the eastern shore and Fort Montgomery, we endeavoured to avail ourselves of the model of that which had proved effectual in the Delaware River, and were assisted by the advice and experience of Capt. Hazlewood. But the great length of the chain, being upward of 1,800 feet, the bulk of the logs which were necessary to support it, the immense weight of water which it accumulated, and the rapidity of the tide have baffled all our efforts. It separated twice, after holding only a few hours, and we have too much reason to despair of its ever fully answering the important purpose for which it was constructed." [60]

[57] Ruttenber, Hudson's River Obstructions, Page 92.
[58] Force, American Archives: Series IV, Volume 6, Page 672.
[59] Ruttenber, Hudson's River Obstructions, Page 81.
[60] Journal, New York Provincial Convention, Volume I, Page 723.

An investigation showing that the first break was in a swivel which came from "Ticonderogo", and that the second was a "Clevin" made at Poughkeepsie, "in a solid Part of the Chain, and no flaw to be seen in any Part of said Chain",[61] on December 12 the pay of the blacksmiths who had worked on the chain, which had been held up pending the result of the investigation, was restored to them.[62]

Meantime, Lieutenant Thomas Machin, the engineer, presumably had made certain suggestions, for on November 30 he was authorized "to

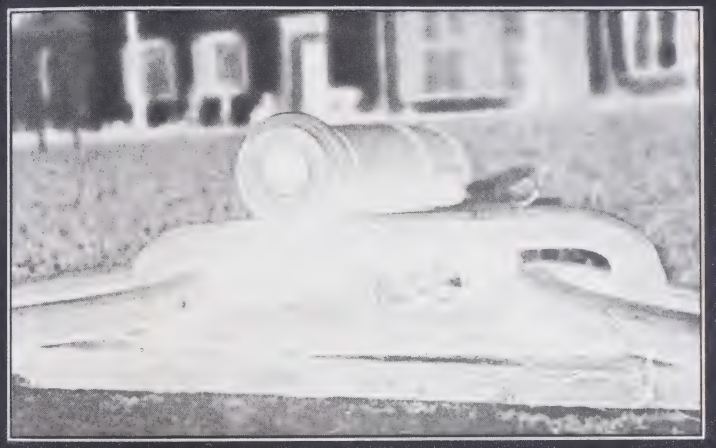


Fig. 7
One of the Larger Links, Showing the Chamfered Edges.
(At Ringwood Manor, Ringwood, New York.)

alter and fix the chain". The work was moved to New Windsor, just below Newburgh, and was carried on under the supervision of Governor Clinton. On March 7, 1777, a committee reported that the work was in a "great forwardness", "the Timber for buoying the Chain prepared", etc.; March 14 Clinton reported that they were only waiting for anchors and cables to draw the chain across the river, as the logs for buoying it were all fixed; and about the 23d of March it was put in place, and remained without incident until October 6 of that year.[63]

[61] Ruttenber, Hudson's River Obstructions, Page 83.
[62] *Ibid*: Page 83.
[63] *Ibid*: Pages 82-85.

On October 6, 1777, however, General Sir Henry Clinton, on his way up the Hudson expecting to join General Burgoyne, who had come up the Sorel and Lake Champlain, a junction which, if effected, would have been an almost if not quite fatal blow to the cause of American freedom, attacked forts Montgomery and Clinton. Getting some of his forces to the backs of these forts by way of passes which had been left unguarded in the mistaken belief that the British would not attempt to use them, and striking from the water with his fleet, in three hours' time both forts were taken. Beatson says:

> "Every article belonging to their laboratory, which was in the greatest perfection, other stores, such as port-fires, match-harness, spare gun carriages, tools, instruments, a large quantity of provisions, and the boom and chain which ran across the river from Fort Montgomery to St. Anthony's Nose, and which is supposed to have cost £70,000 fell into the hands of the conquerors." A foot-note adds: "This chain was of most excellent workmanship; it was sent to England, and from that to Gibraltar, where it was of great use in protecting the shipping at the moles." [64]

It is generally believed that the Fort Montgomery obstruction consisted of a great chain with a protecting boom in front of it; Beatson says specifically: "the boom and chain", but there are excellent reasons for believing that there was no separate boom, and that the common belief arose from considering the supporting raft system as a boom, and the chain itself as something separate, although carried by the rafts, whereas, properly speaking, the two form one element, while a boom is an entirely separate device.

The evidence leading to the conclusion that there was no separate boom at Fort Montgomery is compelling. To begin with, in an undocumented foot-note regarding the 150 logs 14 feet long which on July 20, 1776, the Secret Committee had requested the Convention to furnish, Ruttenber says:

> "These Logs were subsequently rafted to New Windsor and used in constructing the Boom at West Point." [65]

If Ruttenber is correct, this would indicate that if the logs had been used in a boom at Fort Montgomery they had escaped destruction at the time the chain was taken. It seems hardly likely, however, that after cutting such an obstruction the British would have allowed it to drift away practically unharmed.

Secondly, in the New York State Museum at Newburgh is an original bill from Robert Erskine, proprietor of the Ringwood furnace and iron

64 Beatson, Naval and Military Memoirs: Volume IV, Page 236.
65 Ruttenber, Hudson's River Obstructions: Page 67.

works. It is for clips, links, bolts, etc., and has been cited by several writers as proof that Ringwood furnished part of the Fort Montgomery chain. Unfortunately for this claim, however, the dates of the shipments are clear proof to the contrary. Nowhere is there to be found any intimation that the chain was not complete at the time of its second placing in March

COPIED FROM THE ORIGINAL IN THE NEW YORK STATE MUSEUM
WASHINGTON'S HEADQUARTERS, NEWBURGH, NEW YORK

Messers Thomas Machin & John Nicoll
For the United States of America

To Robert Erskine, Ringwood, Dr.

1777		No. of Clips	No. of Links	No. of Bolts	By Whom Carted	Weight
August	21 To	27	18	...	Henry Cole	1- 0- 1- 0
Septemr	8 "	...	11		Ditto	4- 0-21
	9 "	19	18	.	Robert Davenport	16- 1-21
October	2 "	18	27	18	Patrick McDougland's Negroe	19- 2- 0
	4 "	14	21	14	William Clark	15- 0- 7
	6 "	16	15	16	Richard Goldsmith, Junr	15- 2-14
	" "	18	30	18	Ditto	1- 1- 1- 0
	" "	..	42	.	Jonathan Wythe	15- 0-21
	" "	24	.	24	Ditto	15- 0- 7
	" "	16	24	16	Coleman Curtis	18- 2- 7
	" "	14	21	14	James Runels	15- 3-14
	7 "	28	12	28	David Sutherland	1- 0- 3- 0
	" "	30	.		John Mandevill	15- 1- 0
	" "	28	...	27	Henry Vandousar	15- 3- 7
Novemr	1 "	51	37	22	at Ringwood	2- 1- 1- 0
					Waste	1- 7- 0- 0
		303	276	197		Tons 14-17- 0- 7

46 Setts of Clips, Bolts & Chains Compleat } 14-17- 0- 7
29¾ Setts Clips & 3¼ Setts Bolts }
101 Bars 2 inch Chain Iron 3- 8- 0-21
100 Bars 1½ Inch ditto 2-10- 1- 7 5-18- 2- 0

T. C. Q. lbs Tons 20-15- 2- 7 @ 140 £2908-18- 9

To Making 14-17- 0- 7 of Bar Iron into the above into Bolts & Chains 140 2079- 8- 9
To Carting the First two Loads Wt. 1- 4- 1-21 12- 4- 4½
£5000-11-10½

By Cash Received in part of Capt. Machin's Order on Capt. Nicoll for £2,000 1300- 0- 0
Balance £3700-11-10½

N. B. This Account shall be further credited with the above 5-18- 2- 0 of Iron made for the Boom & Moving Chain if not wanted by the States Amounting to 829-10- 0
Which will reduce the Balance to £2871- 1-10½

FIG. 8

BILL OF ROBERT ERSKINE OF RINGWOOD FURNACE, FOR IRON INTENDED FOR THE FORT MONTGOMERY BOOM, BUT WHICH, DELIVERED TOO LATE FOR USE THERE, WAS USED IN THE WEST POINT BOOM.

of 1777, nor that it was in any way disturbed between that date and October 6 of the same year, when it was captured by the British, while the earliest shipment of the bill is dated August 21, 1777, and of the total of 33,271 pounds of iron billed, all but 8,449 pounds were shipped—or at least billed—from Ringwood, a full day's haul distant, on or after October 6th. The fact would seem to be that it had been planned to have a boom in front of the

chain, and that because of the large amount of iron required the order had been divided between Ringwood and Sterling, the Noble, Townsend works, but that in spite of this precaution the material did not arrive until it was too late for use as intended, and it was then employed for the West Point boom. The Sterling bill, the last item of which is dated February 2, 1778, leads Ruttenber to say of it and of the West Point boom:

> "Its (the boom's) Construction was evidently commenced with the Intention of employing it at Fort Montgomery x x The annexed Bill of Noble, Townsend & Co., it will be seen, commences before the Reduction of Fort Montgomery and closes before the Contract was made for the Chain." [66]

Finally, we have General Putnam's letter of February 13, 1778, to General Washington, in which he says:

> "Parts of the boom intended to have been used at Fort Montgomery, sufficient for this place, are remaining." [67]

"this place" being West Point. It will be noted that the boom was "intended to have been used", not "was used".

The Fort Constitution Obstruction

It would seem that on July 26, 1776, the day of their appointment to superintend the making and fixing of a chain:

> "across Hudson's River at the most convenient place near Fort Montgomery x x and if it should be found Impracticable at or near the said Fort, then to fix the same at or near Fort Constitution." [68]

Messrs. Augustus Lawrence and Samuel Tudor were in favor of the Fort Montgomery site, leading Jacobus Van Zandt, the third and minority member of the group, to write from "Poughkeepsea" on the same day to Governor Clinton:

> "Agreeable to orders receaved, from Secreet Committee, I have obtaind from Coll. Clinton the distance from fort Constitution to the West Point, to be ab't 23 Chains, (ab't 1518 feet, CRH), and on Examing the Shore on Each side of the river have found Rocks Sufficient to Secure the ends of Chain. The Cityvation of the forts and Cross running of the tides with the Bafiling winds generally here, and with the assistance of what Cannon already mounted, we can defend the Chain much better here than at fort Montgomerie; and what will add grate Strenght to us, by placeing Number of men on the hills at West Point with Musquetery, we can annoy the Ships in Such manner that no man will be able to Stand her decks, provied, the Ships should Incline more to West Point then the fort side.

[66] Ruttenber, Hudson's River Obstructions: Page 140.
[67] Boynton, History of West Point: Page 60.
[68] Ruttenber, Hudson's River Obstructions: Page 70.

> "You may perhaps object fixing the Chain here on acc't of not heaving Cannon. I can assure you that we Shall have plenty of Six pounders Mounted before the Chain is ready; these in my opinion will be Sufficient to doe the needfull If they are well Supply'd. Coll. Clinton I hope in the Course of one Week, will have addition to his forts of 18 Six pounders and If Mr. Jay Succeeds at Salsburry, I am also in hopes to have the 12 pounders ready to annoy our Enemies If they Should attempt to come up long before the Chain is ready, so that, on Whole I am fully Convinced that fort Constitution will far Exceed the fixing of Chain Cross River, then at fort Montgomeria; but this Shall leave to your better Judgement.
>
> "I Could wish you would Examing both places well, and Consider ware the Chain can be best Defended. I am in grate hopes that Mr. Jay will Succeed in the Cannon, as Gen'l Washington has wrote to Gov'r Tremble on the Subject, and as soon as the Express returns with the Demitions of the Cannon I shall order proper Carriges made; hope they will be ready before the guns reaches you, as well with every necessary articall wanted in that way; this we pupose to doe in our yard, by persons who are acquainted with that kind of work. I could wish If we git those guns from Salsburry, to have your head Carpenter from fort Constitution to lay out the Carrage work, who under Stands Such part of business better than our head projecture in the Carrage way, but this we shall Inform you of nother time.
>
> "Your Whale boats hope will be ready this week. Six fire Rafts we Shall Launch to morrow Evining, four more Monday Evening, the Six Sloops the Secret Committee are to furnish us with from Albany &c &c &c as Soon as they come to hand; we Shall fixt them provied they Send us the Meterialls along with them. I could wish when they arrive with us, you could Spare Mr. Seamons and Miller, and Send them up to us, with about 30 wood Cutters of your Solderey, who can assist us much so that when they are all ready fixt here you'l have nothing to doe with them but to put your plan into Execution In case the Enemie comes Near you. I hope you'l Excuse this Scrol, having no time to fair Copy. I remain with utmost Respect
>
> Sir Your Humb. Serv't
>
> Jacobus Van Zandt
>
> P. S. The Secreet Committee only one of them here, when they return Shall lay my proposal before them ab't the Chain." [69]

For some time thereafter the Secret Committee was uncertain as to whether or no the better location at Fort Constitution outweighed the better defenses at Fort Montgomery. On October 9, it was:

> "Resolved, That a Fortification be erected at West Point in order to Defend the Chain, and that Robt. Harper, Henry Wisner, Jacob Cuyler and Gilbert Livingston be a Committee to carry the said Resolve into execution." [70]

But five days later, for reasons quoted in full in the account of the Fort Montgomery obstruction, the Committee:

[69] Clinton Papers: Volume I, Page 273.
[70] Ruttenber, Hudson's River Obstructions: Page 79.

"Resolved, That Mr. Machin immediately prepare a place on each Side the River at Fort Montgomery to fasten the Ends of the intended Chain to." [71]

From this it might appear that Mr. Van Zandt had lost his plea for a chain at Fort Constitution, but that there was an obstruction, and one of considerable importance, at that locality, as well as the one at Fort Montgomery, is evidenced in Beatson's account of the taking of the latter:

"Another boom, near Fort Constitution, which must likewise have cost much money and labour, was rendered useless." [72]

Except for this statement by Beatson, and one or two quotations of it, no other reference to this obstruction has been found.

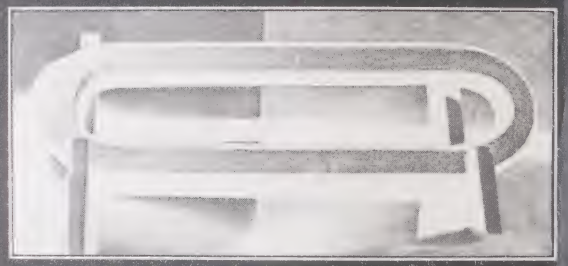


FIG. 9
LARGE LINK OF WEST POINT CHAIN.
Note roughness of bar and the heavy weld at left as compared to Ringwood Manor and Coast Guard Academy links.
—Courtesy American Chain and Cable Company

THE TICONDEROGA OBSTRUCTION

Although General Schuyler, in reply to the request of the New York Secret Committee for the Sorel chain, or at least as much as could be spared, had written, on July 25, 1776, that:

"Before I left Tyconderoga we had it in Contemplation to Draw it across that Part of Lake Champlain which Divides Tyconderoga from the Camp we occupy on the East Shore opposite to it." [73]

and a piece of the chain had been sent to Robert Yates at Poughkeepsie on August 13 of that year, nothing seems to have been done at Ticonderoga until October 17, on which date Jeduthan Baldwin, whom General Washington had sent to that post as Military Engineer, recorded in his Journal:

[71] Ruttenber, Hudson's River Obstructions: Page 81.
[72] Beatson, Naval and Military Memoirs: Volume IV, Page 236.
[73] Ruttenber, Hudson's River Obstructions: Page 68.

"Mounting Cannon, Making Carriages &c. Begun to make a log across the Lake or Chain to prevent the Shiping coming past the Jarsey Redoubt." [74]

and three days later:

"Supt. with Genl. Gates, proposed making a bridge a cross to Independant Point it was aprovd. of by the Genl." [74]

Accordingly, on October 22, Baldwin "began to put ye boom togeather"; on the 25th "finish the boom acrosst & building a Bridge"; and on the 29th "finished the bridge across the Lake to Independant point so that men could pass." [74]

General Schuyler seems to have had some doubts as to the strength of these works, for on November 6, writing from Albany to the Congressional Committee which had been sent to Ticonderoga to investigate the condition of the Northern Army, he said:

"The Navigation should be effectually stopped by sinking Cassoons at small Distances, and joined together by String Pieces, so as at the same Time to serve for a Bridge between the Fortifications on the east and west Side." [75]

Schuyler's concern was soon justified. Under date of December 15, 1776, one George Measam wrote to General Gates:

"Yesterday the violence of the wind parted the bridge to Mount Independence, and this day the lake froze across strong enough to walk over. The boom was carried away soon after you left the garrison." [76]

Schuyler had suggested that the stronger construction should be executed in the winter, but it was March 1, 1777, when Baldwin "began to build the Great Bridge, from Ticonderoga to Independant point". On the 9th he records: "Sunk 10 Cassoons & put down many of the posts", and on the 10th "getting down the Cassoons; the Ice began to fail". About this time Baldwin's luck also began to fail. On March 26 "one Peer of the Grt Bridge fell to peices"; on the 27th "the Bottom of another Peer fell out"; on April 12 "got the Boom a cross the Lake"; but on April 21 "one of the piers of the Bridge turnd. over"; while on May 25 "the boom & Bridge in a heavey gale of wind gave way & with some difficulty they were brought back to place." This, however, was the last of the construction troubles recorded; on May 29 the men were at "work at ye Bridge Anchoring of ye Boom & geting Logs for it", and on June 14 "movd the floating Bridge to the loer side of the Peers." [77]

[74] Jeduthan Baldwin, Journal: Pages 82-84.
[75] Bulletin, Fort Ticonderoga Museum: Volume III, Page 243.
[76] *Ibid*: Volume V, Page 35.
[77] Jeduthan Baldwin, Journal: Pages 94-105.

Beatson gives this description of the combined bridge and obstruction:

> "Between this post (Mount Independence, CRH) and Ticonderago was a large and strong wooden bridge of communication, which was supported by twenty-two sunken piers of large timber, at nearly equal distances. The spaces between them were filled by separate floats, each about fifty feet long and twelve feet wide, strongly fastened together by chains and rivets, and also fixed to the sunken piers. Before this bridge was a boom, made of very large pieces of round timber, bound together by rivetted bolts and double chains, made of iron an inch and a half square." [78]

Burgoyne, taking advantage of St. Clair's pig-headed obstinacy in insisting, in the face of proof to the contrary, that a hill dominating the post would be inaccessible to an enemy, had moved artillery to that height, forcing St. Clair to a shameful retreat, and the morning of July 6, 1777, saw the British taking over Ticonderoga. Burgoyne says of the reduction of the obstruction:

> "The gun-boats were instantly moved forward, and the boom and one of the intermediate floats were cut with great dexterity and dispatch, and Commodore Lutwidge, with the officers and seamen in his department partaking the general animation, a passage was formed in half an hour for the frigates also, through impediments which the enemy had been laboring to construct since last autumn." [79]

The Isle Aux Noix Obstruction

The story of the Isle aux Noix obstruction, at least so far as the writer has been able to discover, is told by but one person, the Reverend Benjamin Trumbull, who accompanied the Montgomery expedition of 1777 into Canada and kept a diary which either he or some one else copied, more or less carefully, at a later date, for there are at least two texts, one owned by the Fort Ticonderoga Museum, the other by the Connecticut Historical Society, each entitled:

> "Minutes, or a Concise Journal of the principal Movements of the Continental Army towards, and in the Country of Canada; of the Siege and Surrender of Chambly and the Forts at St. John's &c 1775."

Telling how the expedition under General Montgomery left Ticonderoga August 28, 1775, and on September 6 arrived within sight of the forts of St. John's, when they landed and had a skirmish with the British, Trumbull continues:

> "On the 7th the General finding that ye Enemy were much stronger than he expected to find them, and having neither Ordnance or military Stores for a formal Siege thought proper to retreat to the Isle Au Noix. He addressed the Troops, on this Occasion, in General Orders in the following Manner.
>
> "'Camp near St. John's Septr. 7th 1775.
>
> "'The General thought it expedient to advance to St. John's in Order to try the Disposition of the Canadians, and give them an Opportunity to take up Arms in the common Cause; but being in no Condition to undertake a Siege, either with Respect to Artilery or Numbers, and finding that the Enemy have a Vessel of Force launched and nearly completed, he thinks it absolutely necessary to return to the Isle Aux Noix, to make such Preparations there as may effectually prevent the Enemy's naval Force from entering the Lake. x x x'
>
> "The Army embarked immediately and returned the same Day to the Isle Aux Noix.
>
> "Here the Troops were employed some Days in laying a Boom across the Lake and in making Preparations to receive the Enemy and prevent their getting into the Lake, provided they should attempt it." [80]

[78] Beatson, Naval and Military Memoirs: Volume IV, Pages 206-207.
[79] Burgoyne, State of Expedition to Canada: Appendix XVI.

This last paragraph is missing from the Connecticut Historical Society copy of the diary, nor has the writer been able to find any reference whatever to this boom, other than in the above quotation from the Fort Ticonderoga Museum copy of the "Minutes".

The Delaware River Chain

The Delaware River obstruction started out to be a boom; it was changed to chevaux-de-frise; and finally wound up as a combination of chevaux-de-frise and chain, although Beatson, in his detailed account of the reduction of the obstruction, refers only to the "frames" as he terms the chevaux-de-frise.

On July 5, 1775, the Pennsylvania Committee of Safety, which had been appointed but a week before, went to "Red Bank", a little below Philadelphia, and decided that it was "at present impracticable to lay a Boom across that part of the River." [81] For several months thereafter attention appears to have been directed entirely to the chevaux-de-frise, "machines", or "frames" as they variously are termed.

Possibly the successful "blockade running" by vessels without regular pilots led to consideration of means to close the channel completely in case enemy ships came up the river, for on November 8, 1775, Owen Biddle, Captain White and George Clymer were named to consider the most efficient way of connecting the chevaux-de-frise with chains, and they were instructed to procure a chain for the purpose.[82] Their plan was to sink a

[80] Benjamin Trumbull, Journal: Bull. Fort Ticonderoga Musuem, Volume I, Number 1, Pages 13-14.
[81] Force, American Archives: Series IV, Volume 2, Page 1771.
[82] *Ibid*: Series IV, Volume 3, Pages 1837-1838.

couple of piers either side of the channel, and stretch the chain—or boom, as it is sometimes called—between, a plan which had its difficulties. On March 26, 1776, Biddle and Clymer were directed to employ Arthur Donaldson to build two piers, to be sunk for fixing a boom to obstruct navigation,[83] and presumably they were completed by July 15, when Donaldson and Thomas Penrose were authorized "to fix the two piers x x x and also fasten the boom thereto." [84]

Donaldson and Penrose did not complete the work, however, for on September 14 Captain Blewer and Mr. Gurney were:

> "empowered to contract with some person or persons to fill up and complete the Piers sunk in the channel of the river Delaware, near Fort Island, and fix the Chain for stopping the navigation upon an emergency." [85]

The British attack on the obstructions, which were not completely reduced until November 20, began on October 1, 1776, but for some reason it was not until October 11 that the Committee of Safety:

> "Resolved, That Messrs. David Rittenhouse, Joseph Blewer, Emanuel Eyres, and Peter Brown, go down to the Piers tomorrow, and fix upon a method for fastening the chain, and give directions to Thomas Davis and Lewis Gyon to prepare everything necessary to fasten it without delay; and that the Commodore order the boom to be brought up to Kensington, to Mr. Peter Brown's landing, as soon as the tide will serve." [86]

The fact that Beatson, in his detailed account of the destruction of the obstructions says nothing whatever about either a chain or a boom, and that the decision to have "the Commodore order the boom to be brought up to Kensington" was not made until October 11, raises the question whether the British may not have intercepted it and prevented its intended use. In any event, it seems to have played a very small, if any, part in the defense.

The West Point Obstruction

The ease with which General Sir Henry Clinton had gone up the Hudson as far as Kingston, burning that town, capturing forts Montgomery and Clinton and their chain obstruction, and ravaging the countryside on the way, was a cause for grave concern to the Americans, and at once raised the question as to what should be done to prevent a repetition with even worse results. Washington wrote Putnam:

> "By gaining the Passage, you know the Enemy have already laid waste and destroyed all the Houses, Mills and Towns accessible to them. Unless proper Measures are taken to prevent them, they will renew their Ravages in the Spring, or as soon as the Season will admit, and perhaps Albany, the only Town in the State of any importance remaining in our Hands, may undergo a like Fate, and a general Havoc and Devastation take place." [87]

On November 6, 1777, Colonel Hugh Hughes wrote General Gates that on the previous day, in company with General James Clinton and others, he had visited "the forts" "in order to erect some further obstructions", and that "The Boom will be near Fort Constitution, and a work on the west shore to defend it." [88]

Gates may have questioned the wisdom of this decision, for on November 24th General Clinton, then at New Windsor, wrote him:

> "I know of no other method of obstructing the passage of Hudson's River, but by Chevaux-de-frise, Chains, and Booms, well defended by heavy artillery and strong works on the shore. The former is impracticable at any place lower down than where the present are, (Pollopel's Island, CRH), near this place; and even there, the river is rather too wide to admit of their being properly defended; they may, however, when completed, be a very considerable obstruction. This with a chain or boom, at a part of the river called the West Point, where it is quite narrow, and the wind, owing to the crookedness of the river, very uncertain, with proper works on the shore to defend it, and water-batteries on shore calculated to annoy shipping, would, in my opinion, perfectly obstruct the navigation." [89]

On December 2, Washington urged Putnam to:

> "employ your whole force and all the means in your power for erecting and completing, as far as it shall be possible, such works and obstructions as may be necessary to defend and secure the river against any future attempts of the enemy." [90]

Putnam had not been in the best of health, and doubtless with this and the remembrance of his failure to come to the aid of forts Montgomery and Clinton in mind, Washington at the same time directed General Gates to attempt the recovery of the posts on the "North River", and, if successful, to put them "in the best posture of defense", while Governor Clinton was requested to "take the chief direction of superintendance of this business." Gates, however, had just been appointed to the War Board, and paid no attention to his assignment, while Clinton offered to co-operate, but felt his other duties precluded his taking charge of this extra one, thus leaving the "business" entirely up to General Putnam.

[83] Force, American Archives: Series IV, Volume 5, Page 730.
[84] *Ibid*: Series V, Volume 1, Page 1296.
[85] *Ibid*: Series V, Volume 2, Page 66.
[86] *Ibid*: Series V, Volume 2, Page 84.

[87] Sparks, Correspondence: Volume V, Page 177 (Ruttenber, Page 121).
[88] Gates Mss. in N. Y. Historical Society Collections, as quoted by Boynton, West Point History; Page 48.
[89] *Ibid*. Page 50.
[90] Sparks, Revolutionary Correspondence, Volume V, Page 178.

As soon as the matter of the responsibility had been settled, Putnam requested the New York Provincial Convention to appoint a committee to confer with him on the best locations for the proposed works. Their choice of committeemen, however, was rather unfortunate; appointed on January 8, by the next day there had been such "a disagreement in sentiment" that the committee recommended the appointment of Commissioners —presumably hoping the new title might improve relations—to go with the generals and other officers to view the several passes on Hudson's River and "advise in fixing the places where such fortifications should be erected. Whereupon the Convention:

> "Resolved, That John Sloss Hobart, Esq., one of the Justices of the Supreme Court, The Hon. Robert R. Livingston, Chancellor of this State; Mr. Platt, Mr. Wisner, and Colonel Hathorn, be, and hereby are, appointed Commissioners for the purpose above mentioned, and proceed to that business with all possible dispatch." [91]

On January 14 the Commissioners reported in considerable detail the advantages and disadvantages of both the site "on which Fort Clinton lately stood", and that at West Point, concluding "that the most proper place to obstruct the navigation of the river is at West Point". A week later General Samuel Parsons moved his brigade on to the chosen site and began work on the proposed fortifications as laid out by the French engineer Radiere.

Meantime Colonel Timothy Pickering, a member of the War Board, and Captain Machin, on the assurance of Peter Townsend of the Sterling Iron Works, that his company could furnish a chain which, while not so heavy that its handling would be impossible, could effectually withstand the strain and shock of any ship then known, according to Lossing:

> "arrived at the house of Mr. Townshend late on a Saturday night in March of that year (1778, CRH) to engage him to make the chain. Townshend readily agreed to construct it and in a violent snowstorm, amid the darkness of the night, the parties set out for the Stirling Iron Works. At daylight on Sunday morning the forges were in operation." [92]

Lossing is in error in placing the trip in March, for the date of the contract is February 2, 1778. The fact that that date fell on a Monday, however, lends a measure of support to the rest of Lossing's story.

The contract is as follows, this transcription being from what H. M. Hornor, Jr., in his "Obstructions of the Hudson River during the Revolution" claims to be a facsimile of the only existing original, "the copy

[91] Jour. N. Y. Prov. Conv.: Page 1113 (as quoted by Boynton, Page 53).
[92] Lossing, Field Book of the Revolution: Volume I, Page 706.

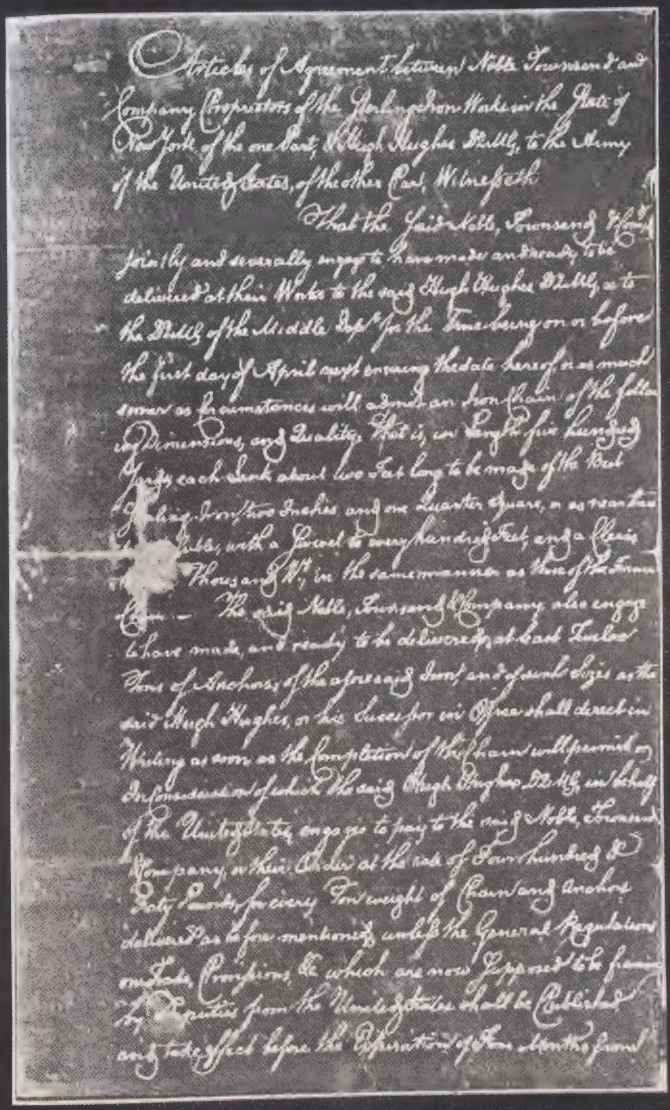


Fig. 10
Facsimile of the Contract for the West Point Chain.

among the Clinton papers in the New York State Library at Albany having been destroyed in the fire of 1911."

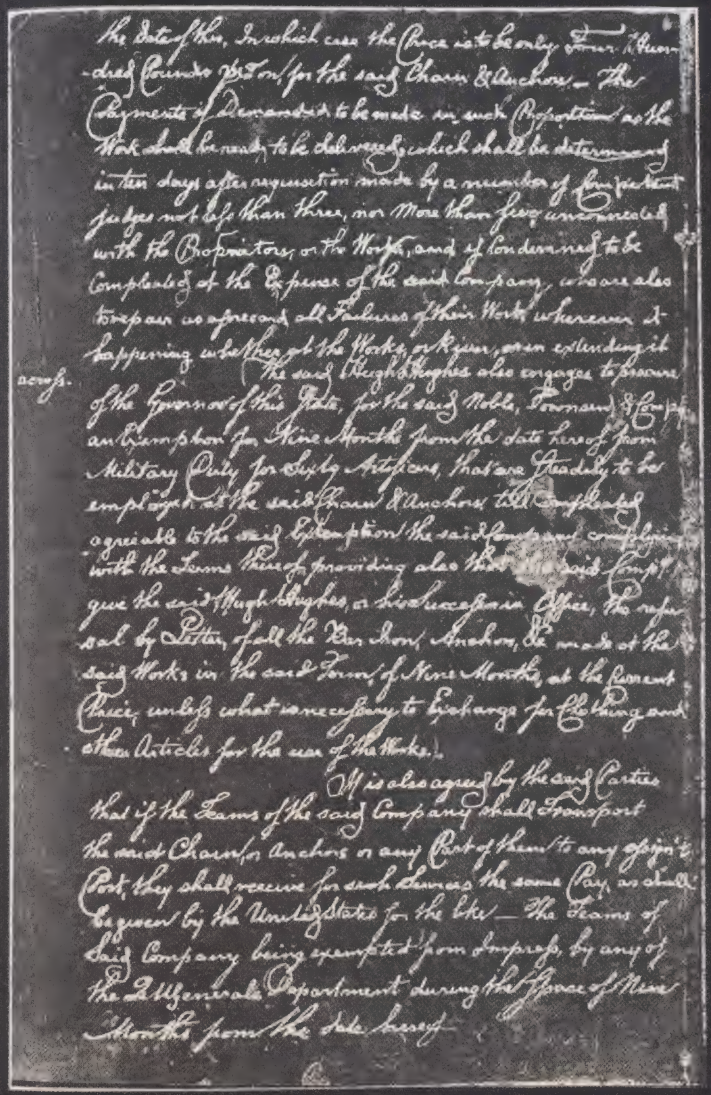
Articles of Agreement between Noble Townsend and Company Proprietors of the Sterling Iron Works in the State of New York, of the one Part, & Hugh Hughes DQMG, to the Army of the United States, of the other Part, Witnesseth

That the said Noble, Townsend & Compy jointly and severally engage to have made and ready to be delivered at their Works to the said Hugh Hughes DQMG, or to the DQMG of the Middle Dept for the Time being on or before the first day of April next ensuing the date hereof, or as much sooner as Circumstances will admit an Iron Chain of the following Dimensions, and Quality, That is, in Length five hundred Yards, each Link about two Feet long to be made of the Best Sterling Iron, two Inches and one Quarter Square, or as near thereto as possible, with a Swivel to every hundred Feet, and a Clevis to every Thousand Wt., in the same manner as those of the Former Chain.

The said Noble, Townsend & Company, also engage to have made, and ready to be delivered, at least Twelve Tons of Anchors, of the aforesaid Iron, and of such Sizes as the said Hugh Hughes, or his Successor in Office shall direct in Writing as soon as the Completion of the Chain will permit. In Consideration of which the said Hugh Hughes DQMG, in behalf of the United States, engages to pay to the said Noble, Townsend & Company, or their Order at the rate of Four hundred & Forty Pounds, for every Ton weight of Chain and Anchors delivered as before mentioned, unless the General Regulations for Trade, Provisions, &c, which are now Supposed to be framing by Deputies from the United States shall be Published, and take effect before the Expiration of Four Months from the Date of this, In which case the Price is to be only Four Hundred Pounds pr. Ton, for the said Chain & Anchors. The Payments if Demanded, to be made in such Proportion as the Work shall be ready to be delivered, which shall be determined in ten days after requisition made by a number of Competent judges not less than three, nor More than five unconnected with the Proprietors, or the Works, and, if Condemned to be Compleated at the Expense of the said Company, who are also to repair, as aforesaid all Failures of their Work, wherever happening whether at the Works, or River, or in extending it across.

The said Hugh Hughes also engages to procure of the Governor of this State, for the said Noble, Townsend & Compy an Exemption for Nine Months from the date hereof from Military Duty for Sixty Artificers, that are Steadily to be employed at the said Chain & Anchors, till Compleated agreeable to the said Exemption, the said Company complying with the Terms thereof, providing also that the said Compy give the said Hugh Hughes, or his Successor in Office, the refusal by Letter, of all the Bar Iron, Anchors, &c. made at the said Works in the said Term, of Nine Months, at the Current Price, unless what is necessary to Exchange for Clothing and other Articles for the use of the Works.

It is also agreed by the said Parties, that if the Teams of the said Company shall Transport the said Chain, or Anchors, or any Part of them, to any assign't Post, they shall receive for such Services the same Pay, as shall be



the Date of this, In which case the Price is to be only Four Hundred Pounds pr Ton for the said Chain & Anchors — The Payments if demanded to be made in such Proportion as the Work shall be ready to be delivered, which shall be determined in ten days after requisition made by a number of Competent judges not less than three, nor More than five unconnected with the Proprietors, or the Works, and if condemned to be Compleated at the Expense of the said Company, who are also to repair as aforesaid all Failures of their Work wherever happening whether at the Works or River, or in extending it across. The said Hugh Hughes also engages to procure of the Governor of this State, for the said Noble, Townsend & Compy an Exemption for Nine Months from the date hereof from Military Duty for Sixty Artificers, that are Steadily to be employed at the said Chain & Anchors till Compleated agreeable to the said Exemption the said Company complying with the Terms thereof providing also that the said Compy give the said Hugh Hughes, or his Successor in Office, the refusal by Letter, of all the Bar Iron, Anchors, &c made at the said Works in the said Term of Nine Months, at the present Price, unless what is necessary to Exchange for Clothing and other Articles for the use of the Works.

It is also agreed by the said Parties that if the Teams of the said Company shall Transport the said Chain or Anchors or any Part of them to any assign'd Post, they shall receive for such Services the same Pay, as shall be given by the United States for the like — The Teams of said Company being exempted from Impress by any of the Gl Officers of the Department during the Space of Nine Months from the date hereof

Fig. 11

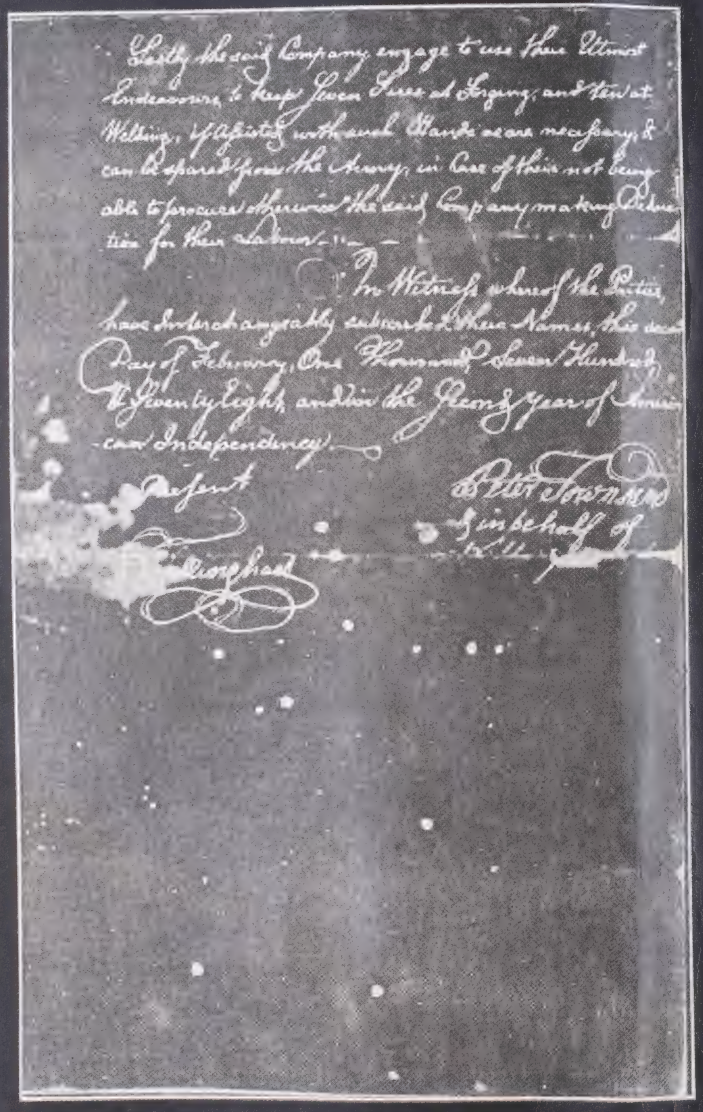


Fig. 12

given by the United States for the like. — The Teams of Said Company being exempted from Impress, by any of the QM General's Department during the Space of Nine Months from the date hereof.

Lastly the said Company engage to use their Utmost Endeavours, to keep Seven Fires at Forging, and ten at Welding, if Assisted with such Hands as are necessary, & can be spared, from the Army, in Case of their not being able to procure otherwise, the said Company making Deduction for their Labour.

In Witness whereof the Parties, have Interchangeably subscribed their Names, this second Day of February, One Thousand, Seven Hundred & Seventy Eight, and in the Second Year of American Independency.

Present	Peter Townsend & in behalf of (see below)
P. Tillinghast	

In the Hornor "facsimile" the line below "& in behalf of" cannot be read. It is interesting to note that Boynton, Fackenthal and Ruttenber give the signature as:

In presence of P. Tillinghast	Peter Townsend In behalf of Noble & Company Hugh Hughes, In behalf of United States

while Coxe has:

Peter Townsend, in behalf of Noble & Company
Hugh Hughes, in behalf of the U. S.
In Presence of
P. Tillinghast.

Boynton, Coxe and Ruttenber have foot-notes to the effect that the text in each case is a copy of the original among the Clinton Papers in the New York State Library at Albany! And it is a peculiar fact that with the exception of the Hornor fac-simile, every transcription of the contract gives the clause concerning fittings as reading: "with a swivel every hundred feet and a clevis every thousand feet."

A clevis, a link with one end closed by a removable pin or bolt, is a device for coupling together sections of a chain, or for attaching a chain to something. If the reading "every thousand feet" is correct, it is obvious that there was desired but one clevis, since the chain was but fifteen hundred feet long, and there naturally arise a couple of questions: Why such a roundabout way of specifying a single clevis? and, What could be the purpose of a single clevis?

The answers are found in the Hornor fac-simile and in Eager's History of Orange County, New York. The correct reading is not "every thousand feet" but "every thousand weight", which is something very different and very understandable. Eager says:

"The chain was made in pieces thus, ten links were fastened together in the usual manner at the forge, and the eleventh link left open at one end like an ox bow, with holes through the ends for a bolt to unite that link with the next one. These composed one load, which was taken to New Windsor by oxen and carts, and transported thence to the Point. The carts used came from Connecticut." [93]

INVOICE FOR BOOM PLACED IN FRONT OF THE WEST POINT CHAIN

The following bill is for the boom, that for the chain has not been found

Quarter Master General By Messieurs Thomas Machin and John Nicoll

To Noble & Townsend, Dr.

1777	No. Clips	No. Chains	No. Swivels	No. Clevices	No. Bolts	No. Bands	By whom sent
Aug. 6	24		6		24		Daniel McConn
21	24		6		24		Francis Welding
21	20		5		20		Amos Miller
23			3	6	6	6	Francis Welding
Sep. 2	16	8			16		David Sutherland
6	12	6			12		D. McConn as far as Thorn's
17	12	8			12		Patrick Sutherland
25	12	9			12	2	David Sutherland
Oct. 2		9					Daniel McConn
Nov. 13	22		1	1	22		Solomon Curtis
Still at works		18			36		And one lod was sent by the Clove that I have not got the number Clips &c.
	142	56	21	7	184	8	

To making 29,249 lbs. clips, chains &c at 1s. 3d.

	Tons	C.	Qrs.			£ s. d.
						2,453- 1- 3
The Wgt. is	17-	10-	1	of Boome Iron &c	at 140s	2,453- 1- 3
1777, June 19	20-	0-	0	Bar Iron by my team	at 140s	140- 0- 0
24	30-	0-	14	do do	at 140s	210-17- 6
26	20-	0-	4	do Col. Curlies	at 140s	140- 5- 0
July 7	20-	0-	0	do Our team	at 140s	140- 0- 0
7	8-	0-	14	do Sam. Bruster	at 140s	56-17- 6
1778, Jan. 20	10-	0-	14	do Mandeville	at 330s	167- 1- 3
28	10-	1-	14		at 330s	171- 3- 4
				Carting 78 of Boome Bar Iron		12-16- 0
						£5,945- 3- 1

Aug.	By Cash paid Mr. Hawxhurst	£ 500- 0- 0	
Sep. 14	By Cash	1,000- 0- 0	
Nov. 14	By Cash paid Nathaniel Satly	240- 0- 0	
Feb. 2	By Cash recived by Col. Hughes	4,027- 0- 0	5,747- 0- 0
	Balance due		£ 198- 3- 1

Fig. 13
Bill of Noble & Townsend, of Sterling Iron Works, for Iron Intended for the Fort Montgomery Boom, but Which, Delivered too Late for use There, was Used at West Point Instead.

It would seem that either the first writer to quote the contract misread it, and that everyone else has copied him, or, as seems more likely, that in making the duplicate copies necessary for its execution the copyist was careless and wrote "Ft." for "Wt.", besides making other errors such as

93 Eager, History of Orange County, New York: Page 566.

the different forms of the signatures. As in those days additional copies of a document had to be made individually and by hand, there was excellent opportunity for error.

As the sections of the chain were completed and hauled to New Windsor they were coupled together and fastened to the log supports. On April 16, 1778, the device was completed and floated down to its site, six and one-half miles below, and on the 30th of that month it was successfully placed, between Constitution Island and West Point, at a spot where the river turns sharply to the east and narrows greatly in width.

Fig. 14
Two of the Logs of the West Point Boom, Now at the Newburgh, New York, Museum.

The boom was installed some time later. Governor Clinton, writing from Poughkeepsie to Governor Jonathan Trumbull on May 1, 1778, said:

> "The chain which exceeds the old one in point of strength was drawn across the river at West Point on the 30th of last month, but the works for its defence at that place, though in good forwardness, are far from being complete." [94]

Unlike the one intended to be used at Fort Montgomery, which was to have consisted of logs some fifty feet in length with pointed ends, the West Point boom had logs but fifteen feet long with rounded ends, close to which were heavy iron straps to which the short sections of connecting

94 Clinton Papers: Volume III, Page 246.

chains were shackled. There are at the Newburgh, New York, museum two of these logs with links of the connecting chain attached, and while the latter are badly rusted and eaten away, they seem to have been made from the same 2¼ inch bar as were the lighter sections of the great chain. If so, with its two sets of chain and its close spaced logs, the boom would have offered much greater resistance to an enemy vessel than would have the chain.

FIG. 15
ENDS OF WEST POINT BOOM LOGS.
Note the strap shackles, and the fibrous character of the link iron.

During the winters chain and boom were hauled up on shore out of reach of the river ice movements, but as soon as the ice broke up they were replaced, remaining throughout the seasons of open navigation until the end of the war, with but one—and that open to question—threat.

Lossing says:

> "It is related that, a few days before the discovery of his (Arnold's, CRH) treason, he wrote a letter to André, in a disguised hand and manner, informing him that he had weakened the obstructions in the river by ordering a link of the chain to be taken out and carried to the smith, under a pretence that it needed repairs. He assured his employer that the link would not be returned to its place before the forts should be in possession of the enemy." [95]

Lossing's story, for which he offers no authority, is generally discredited, but there is a letter from Arnold to Colonel Pickering which, by setting up an alleged reason for working on the obstruction, lends some support to the tale. From the Robinson House, a couple of miles below West Point, on August 23, 1780, a month before the discovery of his treachery, Arnold wrote:

> "I am informed in a letter of the 21st, from the Engineer; that the middle Part of the Chain across the Hudson; at these Parts, is sinking & in a dangerous Situation, on Account of the Logs, which it has hitherto floated on, being water soaken; that unless this be speedily remedied, it will be out of our Power to raise it but with great expense of time & trouble; that new timber cannot be hauled for want of teams of which we have not sufficient for the daily necessities of the Garrison." [96]

Ruttenber comments:

> "Arnold could not have taken a Link from the Chain without removing that Part of the Obstruction altogether; but he could easily have weakened the Boom by removing a Link from either Side." [97]

Other writers, obviously unfamiliar with their subject, have made similar incorrect statements. Actually, the removal of a clevis from the big chain, or a connecting chain from the boom, was a comparatively simple matter. By attaching a block-and-tackle to links or logs either side, and so relieving the strain, the closing pin or bolt of a clevis or a log collar could then be readily removed, and then the clevis or connecting chain. Opening the boom, however, instead of being easier than opening the chain, was twice the work, for there were two connecting chains to be disconnected instead of a single clevis.

At the close of the war part of the chain was salvaged and sold to the West Point Foundry of Cold Springs, which proceeded to melt it up; a part, however, was temporarily lost in the river. A number of years later—80 according to C. B. S. Young [98]—at least part of this section was recovered and kept at West Point until it was borrowed to be exhibited at the Civil War Great Sanitary Fair at New York. It was intended that it should be returned to West Point, but because of transportation difficulties it went instead to the Brooklyn, Navy Yard. Here it stayed until September 4, 1887, when by order of a Naval Board under Commander

[95] Lossing, Field Book of Revolution: Volume I, Page 706.
[96] Hornor, Obstructions of the Hudson River: Page 21.
[97] Ruttenber, Hudson's River Obstructions: Page 145.
[98] Young, C. B. S., The Great Iron Chain: Iron Age, Volume 139, No. 22, Page 44.

R. W. Meade it was sold at public auction, as junk, to W. J. Bannerman & Company, and they, in turn, sold it, with a lot of other scrap, to a forge company. Learning that the Libby Prison Museum of Chicago was looking for War relics, one John C. Abbey, a buyer at Government auctions, hunted up and purchased what remained of the chain, and after selling a number of links to collectors, some ten years later disposed of what was left to Francis Bannerman of New York City, who completed the dispersal of the links.[99]

The many hands through which the pieces of the chain passed after the sale in 1887, gave ample opportunity for the "forgery" which some "doubting Thomases" claim is the explanation of the marked difference in the appearance of some of the links, namely, that some one, having in mind the good market for the relics, had a considerable number of links made for him. The writer has only hearsay evidence as to what is said to have occurred, but the appearance of some of the large links is certainly a bit suspicious.

The smaller, 2¼ inch section links examined are made from a rough squarish bar with every indication of having been formed by hand, and, as far as appearances go, the workmanship of the links themselves is none too good. On the other hand, many of the larger links are made of a smooth, uniform sized bar having evenly chamfered edges, with all the earmarks of having been machine rolled, while the workmanship on the links is perfect.

As of 1937 one hundred and one links supposedly of the chain were distributed as follows: Of the lighter, 2¼ inch section, one is owned by the Connecticut Historical Society; 2 by the Bear Mountain Inn; 3 by the New York State Library at Albany; and 12 by West Point. Of the heavier, 3½ inch section, one is owned by the American Chain & Cable Company of Bridgeport and one by J. T. Davis of Allegheny, Pennsylvania; 2 each by a Mr. Davis of Danbury, Connecticut, and Mr. Peter Townsend Austin of Oyster Bay, New York; 4 by the Smithsonian Institution at Washington; 6 by the United States Coast Guard Academy at New London; 10 by Roscoe Smith of Monroe, New York; 13 by E. J. Searles of Methuen, Massachusetts; 18 by the Chicago Historical Society, and 26 by Ringwood Manor, Ringwood, New York.

Apparently there has been little attempt in the past to check on certain statements which on their face call for investigation. The odd unthinking repetition of "feet" in connection with the contract clause regarding clevises has been noted; an even stranger "parrotting" is the matter of the total

[99] Bannerman, History of the Great Iron Chain: Page 7.

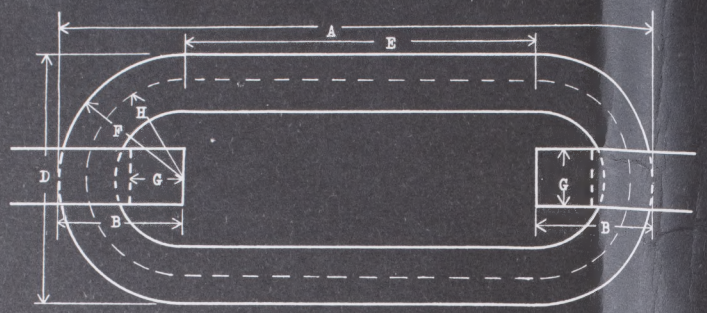
weight of the "chain", for without exception this is given either as 180 tons or practically that, and in most instances, as a part of the same sentence, either dimensions or weight or both, of the links, which utterly contradict the first figure.

The smaller links, 2 feet long, and of 2¼ inch bar, weighed approximately 37 pounds per lineal foot, and, because of the interlinking at their ends, made a chain weighing 46.9 pounds per foot; the largest of the links, 44 inches long and of 3½ inch chamfered bar weighed 83.7 pounds per foot, and made a chain weighing 101.4 pounds per lineal foot. Had the chain consisted entirely of the lighter links it would have weighed 35.2 short—2,000 pounds—tons; had it been all largest links the total weight would have been 76.0 short tons. There has been found nothing to indicate the proportions of each in the chain as actually built; nor to give the number of clevises and swivels, nor the amounts by which their presence would increase or decrease the total weight, but it could not be by much; it seems probable that the actual weight was not over 60 tons. There was a large amount of additional iron required, but it is hard to see where 120 more tons could have been used. The boom had two lines of connecting chain of the lighter section, but the closeness of the logs—about 10 feet apart—made swivels unnecessary, while the construction of the shackling straps eliminated the need for clevises; on the other hand there was the anchorage system, the contract calling for 12 tons of anchors.

There was, however, beyond any question, a very large amount of special iron work required for each chain or boom obstruction, and it is this lighter material, the total tonnage of which in each case was materially greater than that of the chain itself, which is responsible for the stories told of so many forges incapable of producing the great links. The legend probably began with the factual statement that a local forge "made parts *for*" a great chain, but in the course of retellings was changed to the incorrect statement that it "made parts *of*" the chain in question, the latter version attaching to practically all the Revolutionary forges in the Hudson River valley, and for many miles either side of it.

One of the most interesting of these twisted tales is "The Iron Mine of Tamworth", in "New Hampshire Folk Tales". Without one word regarding any mine whatsoever, it is such an astonishing jumble of fact, fancy and wrong dates as to warrant quoting in full:

> "Tradition gives us the following account of the famous chain stretched across the Hudson River below West Point to prevent the ascent of the British ships of war. Some of the links were made at the Tamworth Iron Works now called Chocorua, New Hampshire, and were transported all the way across New Hampshire and Vermont to their destination by ox teams on the snow, in the winter of 1778.



Dimensions in inches except as noted			FORT MONTGOMERY	WEST POINT CHAIN		
				Contract link	*Connecticut Historical Society link*	*Coast Guard Academy link*
Length over all	A		24.00	24.00	30.00	44.00
Linkage	B		3.19	5.00	5.00	7.75
Effective Length	C	A - B	20.81	19.00	25.00	36.25
Width over all	D		10.00	10.00	10.00	12.75
Straight Section	E	A - D	14.00	14.00	20.00	31.25
Outer Radius	F	$\frac{D}{2}$	5.00	5.00	5.00	6.38
Bar Width and Depth	G		1.50	2.25	2.25	3.50*
Center-line Radius	H	$F - \frac{G}{2}$	4.25	3.88	3.88	4.63
Bar Length	I	$2(E + \pi H)$	54.70	52.38	64.38	91.60
Bar Area	J	G X G	2.25	5.06	5.06	11.97**
Link Volume	K	I X J	123.08	265.04	325.76	1,096.45
Link Wt., pounds	L	0.28 X K	34.46	74.21	91.21	307.01
Link Wt., per ft.		$\frac{L}{A}$ X 12	17.23	37.11	36.48	83.73
Chain Wt., per ft.	M	$\frac{L}{C}$ X 12	19.87	46.87	43.78	101.35
Chain Length, ft.	N		1,800	1,500	1,500	1,500
Chain Weight, tons		$\frac{N \text{ X } M}{2{,}000}$	17.88	35.16	32.84	76.02

* 3/8 inch chamfer on all four edges.
** 12.25 less 0.28 because of chamfers.

FIG. 16

"From the Connecticut Valley the teams followed the military road along Black River Valley to what is now Rutland, Vermont, and from there to the Block Houses at the foot of Lake Champlain. The other half of the chain was made from iron furnished by Lewingston Manor at Poughkeepsie, New York. The part of the chain which tradition says was made in Tamworth, New Hampshire, was built in sections so it could be more easily handled. From the Block Houses it was shipped down the Hudson to New Windsor where it was welded with the parts made at the Lewingston Manor. From New Windsor it was floated down the river to Stony Point and stretched across the river to Constitution Island and put in place "all fixed" the latter part of November, 1779. The links of the chain were twelve inches wide and eighteen inches long, the iron about two inches square. The largest links weighed one hundred thirty pounds, the smaller ones ninety-eight pounds, and the total length was seventeen hundred feet. A number of anchors were dropped at distances to give the chain stability. The total weight of chain and anchors was thirty-six tons. Two years were needed to construct the chain and fasten it in place. Fragments are now at the Albany Museum and some at West Point."[100]

It will be seen at once that none of the statements apply to the West Point chain, but that, if dates are disregarded, it does not require as much of a stretch of the imagination to fit them into the Fort Montgomery chain picture as is needed to get the seventeen hundred feet of the Tamworth chain "stretched" the eleven miles between Stony Point and Constitution Island.

The late Albert H. Hall, one-time Massachusetts State Archivist, was very much disturbed over the publication of the story, and went to much trouble to disprove it. It is the writer's belief, however, that it has a basis in facts which Mr. Hall overlooked; that one or more forges at Chocorua Village, Effingham, or in that vicinity, antedating the Tamworth Iron Works—which Mr. Hall pretty conclusively proves could not have been started earlier than 1796—and like it, using Lake Ossipee bog ore, did supply an appreciable amount of the smaller but very necessary iron items for one or more of the chain obstructions, and that the Tamworth legend, which also appears in Weygandt's "New Hampshire Neighbors", is the result of "misremembered" facts.

MAKING A CHAIN

The bars from which the chain links were made were brought to size under the helve-, or trip-, hammer. This, in its usual form, consisted of a wooden beam pivoted at one end and having a heavy iron head on the other. A power driven toothed wheel alternately raised the head and then allowed

100 New Hampshire Folk Tales, First Series: Pages 143-144.

it to fall on the work on the anvil. Rolling mills, for making metal sheets, had been in use for a good many years, but it was not until 1783 that Cort's invention of grooved rolls made it possible to roll bars of any weight.

The 1½ inch, and probably the 2¼ inch, square bars were "drawn down" from the solid anconies, the rough bars produced by the bloomeries, but interestingly enough at least some of the 3½ inch bar was made by welding together—and it was exceedingly well done—a series of comparatively thin strips, as clearly proved by the series of photomicrographs and etchings studied by C. B. S. Young and described by him in the June 3, 1937—No. 22 issue—of "Iron Age", Volume 139.

FIG. 17
HELVE-HAMMER, OF TYPE USED TO MAKE CHAIN LINKS.
Ye Olde Wooden Tilt Hammer in the Hay Creek "Chafery" Forge, Before Being Removed to the Capitol Museum at Harrisburg, Pa. The Only Known One Extant.
—Courtesy Mr. George W. Schultz.

It was comparatively easy to bend the white-hot bar into link form around suitable mandrels, but effecting a successful weld of the ends was quite another matter. Today "soaking pits", a special form of heating furnace, ensure uniform temperature throughout any heavy section to be welded, but in Revolutionary days heating had to be done in the forge fire, and it took a master craftsman to get the correct temperature at the center of the bar without over-heating at the surface. The weld was made under the heavy power hammer, but the chamfers on the 3½ inch bar, which, by removing the sharp edges facilitated handling, were done with a hand hammer.

CONCLUSION

As stated at the outset, and as clearly shown by the preceding more or less sketchy outlines, the river obstructions had little real value as defences, partly through a mistaken belief in their strength, but to a greater extent through failure to realize that their proper function was not as independent and absolute blocks, but rather as delaying devices to hold enemy vessels in the line of fire of shore batteries sufficiently heavy, well manned and protected, to effect their prompt destruction. In the case of the Delaware River obstructions, where there was the nearest approach to such co-ordination, it was seven weeks before the enemy could clear the river; at Ticonderoga and at Fort Montgomery, where the shore defenses were either abandoned or captured after a very brief engagement, the river was cleared in a matter of a very few hours. What would have happened at West Point, had an attempt been made to force a passage there, is anyone's guess.

CONNECTICUT'S SHARE

It is practically impossible to determine with any accuracy Connecticut's share, as separate from that of her neighbors, in these attempts at river obstruction. The Minutes of the New York Secret Committee record the fact that Robert Livingston furnished the bar iron from which was made some 1,200 feet of the Fort Montgomery chain; and it is also a matter of record that most if not all of the ore Livingston used in his works at Ancram, New York, came from Connecticut's famous Ore Hill Mine in "Salsburry". That Connecticut forges furnished a substantial part of the auxiliary chains, anchors and other small iron work for the Hudson River obstructions is almost a certainty, although there are only traditions and circumstantial evidence to support this belief. At all events, it was Danbury ox-carts that hauled the sections of the West Point chain from Sterling Iron Works to New Windsor, as shown by records at Newburgh; and that Connecticut officers and men played a very important part in carrying out the various plans is also a matter of official record.

But irrespective of how the credit should be distributed, as previously noted, the design, fabrication and construction, and then placing the chain river obstructions, constitute most remarkable and outstanding industrial achievements, particularly in view of the limitations of the times, entirely apart from any shortcomings in their military or naval performances.

Acknowledgement

While the writer is greatly indebted to all the good friends who have assisted him in gathering together the scattered bits making up this mosaic, and to whom he expresses his sincerest thanks, he is under particular obligations to the Misses Dorothy Barck, Edith Shepard Freeman, Louise Hardenbrook and Eleanor Murray; to Messrs. Albert C. Bates, Edmund K. Brown, E. M. Marshall, Victor Paltsits, S. H. P. Pell, Kenneth Roberts and Carl Van Doren; and to the late B. F. Fackenthal, Albert H. Hall, Herbert C. Keith and Malcolm D. Rudd.

Bibliography

The writings consulted vary in worth all the way from Casella's "Iron Chains", best characterized by his answer to a criticism of his many statements directly contrary to recorded and well known facts: "My notes when originally gathered were intended for use for a New Jersey publication and the New Jersey angle was stressed" and "For some reason, which I cannot quite comprehend, Mr. Harte places great emphasis on the correctness of historical points" to Ruttenber's masterly "Obstructions to the Navigation of Hudson's River"; and in amount, from the single sentence in Smith's "Our Struggle for the Fourteenth Colony", a sentence which, however, is the only answer found to the question as to where the Sorel chain was between May 10, 1776, and July 25 of that year, to MacGrane Coxe's extended "Sterling Furnace and the West Point Chain".

The titles are:

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Bannerman, Francis	History of the Great Iron Chain laid across the Hudson River at West Point in 1778 by order of General Washington.
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Boynton, Captain Edward C.	History of West Point.
Burgoyne, General John	A State of the Expediton to Canada.
Casella, Angelo	Iron Chains across the Hudson. Bulletin of the National Society Sons of the American Revolution, for April, 1944 (Highly incorrect).
Clinton, George	Papers.
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